

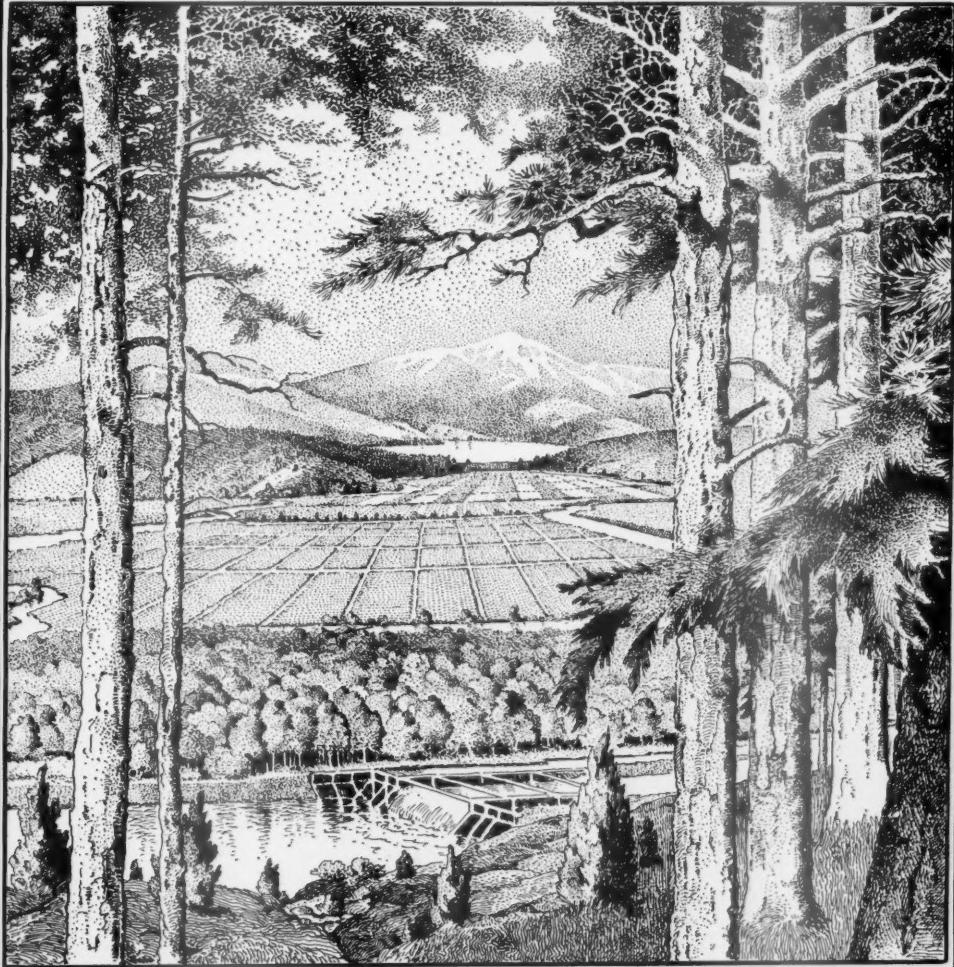
THE AMERICAN FORESTER AT WORK, By ROBT. V. R. REYNOLDS

Vol. X—No. 5

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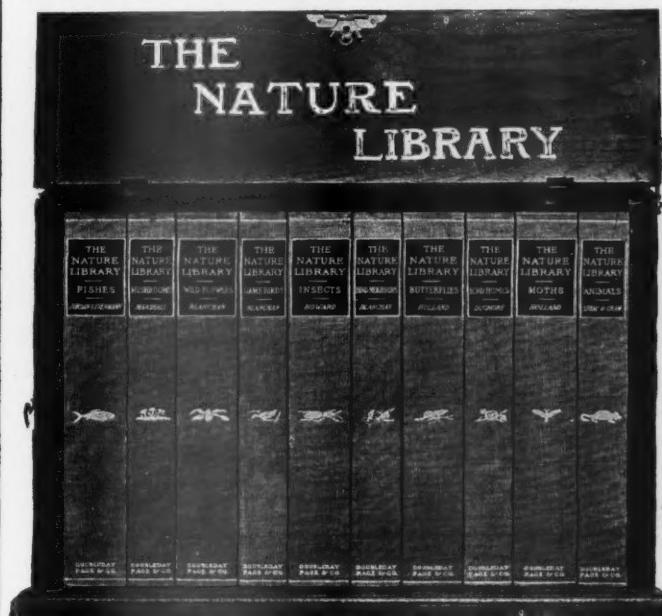
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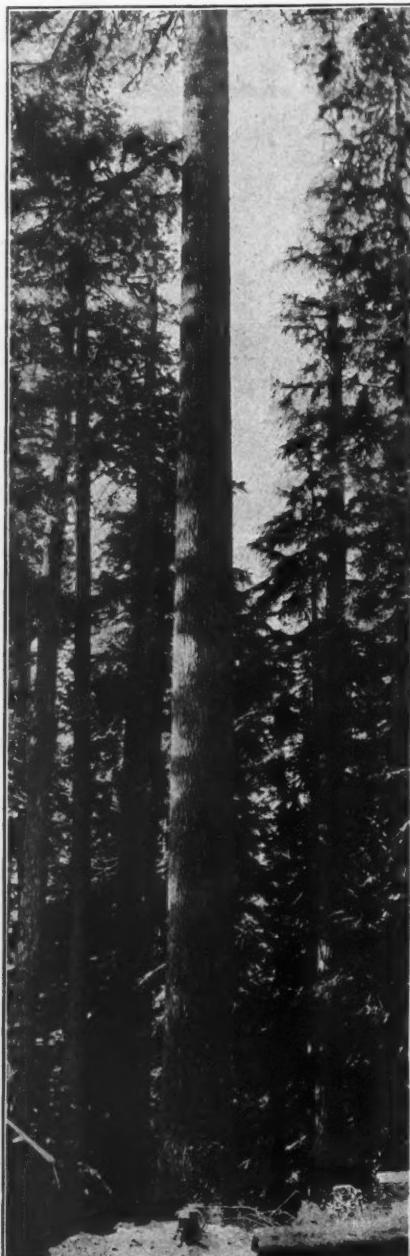
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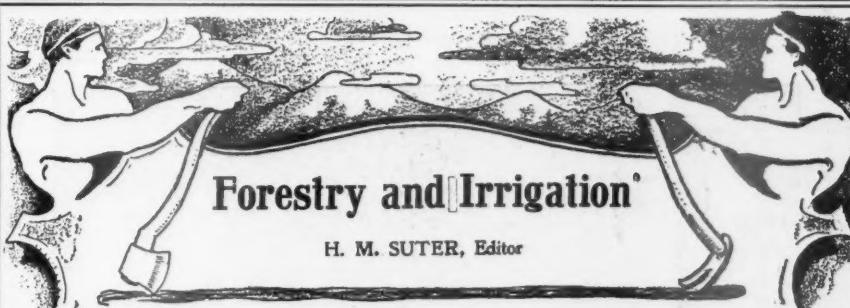
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MAY, 1904.

No. 5.

NEWS AND NOTES.

Notice to Subscribers.

All subscribers to FORESTRY AND IRRIGATION who fail to receive their copies by the fifteenth of the month should notify this office at once. We frequently get complaints from subscribers three or four months after the publication of a certain number, stating that they had failed to receive their copies. Under such circumstances we can not promise to supply the missing numbers. Failure to receive the magazine in many cases is due to subscribers not notifying this office promptly of changes of address. Another matter that should be noted by subscribers is that where they expect their magazine to be forwarded from one post-office to another, postage must be left for this purpose, as required by law, otherwise the postal authorities will not forward it.

The Association Year Book.

The year book of the American Forestry Association for 1904 was sent out to all members several weeks ago. Any one who has failed to receive a copy should at once notify the Secretary, Mr. Edward A. Bowers, P. O. Box 346, New Haven, Conn. We beg to call special attention to the cards which were enclosed in each book and to urge members of the Association to obtain the signature of a new member on the same, and send to the Secretary. Each member should be able to secure at least one new member, and this plan, if carried out, would strengthen the Association tremendously. Kindly lend a hand to forward the movement.

Members will greatly facilitate the work of the officers of the Association and prevent confusion if they will promptly report any errors in their

names or addresses as shown in the year book. The Association has been put to considerable expense and trouble in getting out this book and in trying to keep an accurate list of its members. The coöperation of all is therefore earnestly requested.

In Congress. What Congress did for the forest interests of the country at the session just ended can be summarized in two words—it dodged. In addition to the usual lot of relatively unimportant bills affecting the forests of the United States, there were three before Congress that were of the first importance and in which the American Forestry Association, as an organization, was deeply interested. These were: The transfer of the administration of the federal forest reserves to the Department of Agriculture, in order to combine all government forest work in the Bureau of Forestry, where it properly belongs; the repeal of the Timber and Stone act, which has been agitated for years, and, finally, a bill calling for an appropriation of \$50,000 for the building of roads and trails in the federal forest reserves.

The first two of these measures are familiar to all readers of this magazine, as they have been backed by the American Forestry Association for several years. The third was taken up this winter by Mr. Bowers, Secretary of the Association, in compliance with a resolution passed by the Association at its last annual meeting. This resolution called for an appropriation of \$500,000 by Congress to be expended in the making of roads and trails in the federal forest reserves. Such a move, it was felt, would result in immense improve-

ment in the general administration of the reserves. These roads and trails would be of the greatest service in fighting forest fires.

Mr. Bowers suggested that Congress be asked for only \$50,000 for this purpose, to be available during the coming fiscal year, the idea being that Congress might not be willing to make such a large appropriation at the present time as the resolution called for. His suggestion met with the hearty approval of Secretary Wilson, of the Department of Agriculture, who referred it to the Secretary of the Interior for action. Secretary Hitchcock approved the matter, and it was forwarded, through the Treasury Department, to the Committee on Appropriations.

All this was incorporated in Senate Document 273, copies of which were sent to all the vice-presidents of the Association.

Congress took no action on this matter, nor on any of the others, beyond postponing further consideration of them until some future time. It picked about the edges a little, but the general air of "do-nothing-at-this-session" that hovered over the capitol was too much for the efforts of those who interested themselves in trying to push these measures to a successful issue.

However, the Association has met defeat frequently in the past before finally gaining its point. There should be no let-up between now and the opening of the next session. Let your Senators and Representatives know your opinions on these matters. They will be taken up again promptly with the opening of the next Congress.

Planting a Tie Forest. Under the direction of State Forestry Commissioner Rothrock, the work of planting 50,000 additional locust trees for the Pennsylvania Railroad at Conewago has begun.

The first 50,000 trees, which were planted last fall, are now being trimmed. A month will be required to finish the work.

Next fall the railroad company will plant 200,000 trees, and the following

spring 600,000 trees. Two thousand acres of land will be required, and a tract of land one mile wide and three miles long will be covered. In the course of twenty years the company expects to get 5,000,000 cross-ties from this vast forest.



Forest Fires in New Jersey.

In the annual report of the state geologist there appear some interesting facts about the forest fires which occurred in New Jersey during 1903. F. R. Meier, who acted as consulting forester to the survey, made an investigation of the subject. Owing to the severe drought which prevailed in April and May, there were numerous and extensive fires in various parts of the state. Mr. Meier's examinations show that seventy-nine forest fires occurred in the state. The total of acres burned was 85,046. Compared with 1902, there were fourteen more fires, but the burned tracts measured 13,804 acres less. The damage, however, was much greater, aggregating \$305,744.50, as against \$168,323 in 1902, an increase of about 82 per cent. This great increase in the loss is due in part to the fierceness of the fires, and also to the better class of timber burned.

As to the causes of these fires, the investigation showed that locomotives started twenty-six; persons burning brush or grass, twenty-one; smokers, seven; children, six; incendiary, three, and the balance originated from a variety of causes. The negligence of persons in burning brush resulted in the destruction of 49,197 acres and did damage to the extent of \$169,494, the loss from one fire alone in Burlington county being \$105,000. Those set by locomotives caused a loss of \$79,658 and covered 19,521 acres. These figures are interesting, inasmuch as, in the popular mind at least, the railroad is supposed to be the chief, if not almost the only, cause of forest fires. While it is true that many fires have been started by sparks from the locomotives, yet during the past season only one-third of the fires in New Jersey originated in this way, and these caused only about one-fourth of the loss. Negligence in burn-

ing brush and grass, particularly on windy days, started one-fourth of the fires, burned nearly 60 per cent of the total acreage, and did more than 50 per cent of the damage. In view of these facts, it is evident that there is need for a more rigid enforcement of the law in reference to forest fires, particularly of those provisions which forbid the burning of brush, grass, etc., without maintaining a sufficient watch to prevent its spreading.

Atlantic county suffered the most from forest fires in 1903. Nearly 25,000 acres of timber were swept off, and the loss figured up \$75,205.

Union county had one fire. Three acres were burned over, and the loss was estimated at only \$1.50.



**California
Water and
Forest
Association.**

A special meeting of the California Water and Forest Association was held Saturday, April 23, in the Chamber of Commerce rooms at 307 Sansome street, President W. H. Beatty in the chair, to elect officers for the ensuing year and consider the reports of various men who have been in the field. A delegation of the Outdoor Art League appeared before the association asking for coöperation in saving the Calaveras big trees to government ownership.

Among the reports read was one by E. T. Perkins, of the United States Geological Survey, on the Colorado River and its Possibilities; by H. E. Greene, of Los Angeles, on the Sacramento and its Tributaries; by J. A. C. Clausen, of the United States Reclamation Bureau, on the Inyo, and by Professor Samuel Fortier, of the State University Department of Agriculture, on Irrigation and Agriculture. A paper by Gifford Pinchot, of the Forestry Department, on Special Phases of Forestry in California, was also read.

For the Outdoor Art League Mrs. Lovell White appeared with a large committee of ladies. They read a letter from Secretary Wilson stating that he would be glad to seek a practicable plan of saving the Calaveras big trees to the government, and asked the asso-

ciation to indorse their plan of having a joint federal and state board to appraise these trees for future purchase or condemnation by the United States. The association agreed to this, and passed resolutions indorsing the plan and requesting the Department of the Interior to arrange some way in which this could be done.

Other interesting and valuable papers besides those mentioned, were read at the afternoon session, and the government was asked to continue its present plan of testing timber in California. At the election of officers all the old officers were reelected, Charles Laton being chosen on the advisory board, vice W. E. Smythe, resigned. President William H. Beatty announced that the next meeting would be the regular one in December, and late in the afternoon the association adjourned till that day.

In a discussion during the session of proposed legislation on water rights it developed that the association was divided on its expediency, President Beatty deprecating any attempt at change and Judge John D. Works, of Los Angeles, favoring a revision of present laws.



**Forest Fire
Record.**

With the advance of spring and summer come notices of forest fires of a minor degree of destructiveness as yet, but gradually growing more and more disastrous as the season of their destructiveness reaches its height. The most serious fire so far this season has been raging in the Sierra Madre Mountains of Mexico, about 150 miles from El Paso, Texas. The fire started about a week ago, and has since traversed an area covering many miles, in places sweeping the hills clean of valuable timber in the game and forest preserve country. Second in point of destructiveness were the fires which have been consuming valuable timber in the Pine Mountain district of Kentucky. Forest fires of more or less disastrous degree have been prevalent during the entire month in many sections of North Carolina. Much valuable standing timber and 800 cords of lumber were destroyed

in a fire which broke out on April 22 in Dinwiddie county, Virginia, in the vicinity of Ford's depot, on the Norfolk and Western Railroad.

William M. Canby Dies. By the recent death of Mr. William M. Canby the American Forestry

Association loses one of its most valuable members. He was for several years vice-president for the State of Delaware, and at all times took a great interest in the work of the association. Mr. Canby was one of Delaware's foremost citizens, prominent in business and in many charities. He always took a deep interest in outdoor life, and was president of the Delaware Field Club for a number of years. He was trustee of the fund set apart by his friend, Professor Asa Gray, the famous botanist, for the promotion of the study of botany in this country.

Sargent's *Silva of North America* says concerning Mr. Canby:

"*Crataegus canbyi* grows in hedges and thickets in the neighborhood of Wilmington, Delaware, where it was first noticed in October, 1898, by Mr. William M. Canby, and on the shores of Chesapeake Bay in Cecil county, Maryland. It grows also in the meadows of Tohickon Creek at Quakerstown, Pennsylvania, and on Tenicum Island, at Haddington, and Gray's Ferry, Philadelphia."

He acquired a taste for botany early in life from relatives and afterward in school. Since 1858, when he visited Florida for the first time in search of plants, he had been an active and assiduous collector in many parts of the United States during long and frequent journeys, and his specimens, which have been distributed with a lavish hand, are found in all the large herbaria of the world. His own herbarium of about 30,000 specimens, the harvest of many years of work in the field, supplemented by liberal purchases and by exchanges, having outgrown the space at its disposal, is now in possession of the College of Pharmacy of New York. Since 1893 Mr. Canby had been engaged in forming an herbarium for the Natural His-

tory Society of Delaware, which now contains about 13,000 species. Canby, a genus of delicate and interesting annual plants of the poppy family, natives of the deserts of the West, dedicated to him by his friend, Asa Gray, will recall to botanists the name of Canby and his important and unselfish labors in indorsing the knowledge of the American flora.

Kansas Meeting.

The twentieth semi-annual meeting of the Kansas State Horticultural Society, to be held at Dodge City, Kansas, on May 11 and 12, will have a number of features which should prove instructive and valuable to those interested in forestry and irrigation in Kansas. Several representatives of the Bureau of Forestry will be present and read papers on various phases of forestry in Kansas and elsewhere, and several other prominent speakers will talk on irrigation and its application in various fields of agriculture. The program for the two days' session contains the following addresses on forestry and irrigation:

"Report of Work and Conditions of the State Forestry Station," Hon. Robert M. Wright, State Forestry Commissioner; "Work of the United States Bureau of Forestry in Kansas," William L. Hall, Bureau of Forestry; "Report on Irrigation in Western Kansas," I. L. Diesem, Garden City; "Forestry as Applied to the Development of Kansas," Geo. W. Tincher, Morris county; "Commercial Forestry: Catalpa Culture as an Investment;" "Shelter Belts and Windbreaks," Dr. G. Bohrer, Rice county; "Trials of Fruit Growing in the Semi-arid Region," Nicholas Mayrath, Dodge City; "The Hope of the Semi-arid Region," Hon. F. Dumont Smith, State Senator, Edwards county; "Need of Forest Culture," Representative Victor Murdock; "Progress of Forestry in United States," with stereopticon views, etc., William L. Hall, Bureau of Forestry; "Fruit Growing with Irrigation," C. H. Longstreth, Lakin, Kearny county; "Forestry Planting in Western Kansas," R. S. Kellogg, Bureau of Forestry;

"Commercial Fruit and Vegetable Growing with Irrigation," Hon. J. H. Crowley, State Senator, Rocky Ford, Colorado; "The Reclamation Law and its Application," M. C. Hinderlider, engineer, U. S. Geological Survey; "Insect Enemies of Kansas Trees," Prof. E. A. Popenoe, Chair of Entomology, Kansas State Agricultural College; "Forestry in its Relation to Climate," Prof. I. D. Graham, associate editor of *Kansas Farmer*; "What I Know About Trees," Joseph Mellechor, Ford county; "Woodlot for the Kansas Farmer," R. S. Kellogg, Bureau of Forestry.



Michigan Appoints State Forester. Wesley Bradfield, a student of forestry in the senior class of the University of Michigan, has been appointed forester by the Michigan State Forestry Commission. He will serve on the state forest reserve in Roscommon county. Fifty thousand white pine seedlings have been purchased and will be set out on the reserve this spring; and in addition seed will be sown to furnish the state with its own plants after this year and next.



General Reclamation Notes. Engineer C. H. Fitch has been directed by the Chief Engineer of the Reclamation Service to take charge of the work of that bureau in South Dakota and adjacent areas. The most important piece of work under Mr. Fitch's charge this season will be the completion of the surveys and the beginning of construction, if found feasible, on the Bellefourche project.

Mr. Raymond F. Walter will be continued in charge of the investigation and surveys on this project, occupying a position analogous to that of constructing engineer. Mr. Fitch will have general supervision also of surveys and reconnaissance on the Big Horn project on Crow Indian Reservation, on the Fort Buford project in North Dakota, preliminary surveys on the Bitterroot project, the Lake Basin project, the Sun River project in Montana, and the surveys of New Fork and Green River project in Wyoming.

A competent engineer will be sent soon into western Montana to make a general examination of the opportunities of reclamation, particularly of the character of land ownership, and ascertain the views of the persons owning reclaimable lands regarding the construction of an irrigation work thereon by the government.

With the passage of the Crow Indian bill the Reclamation Service will start a field party at work making a thorough investigation of the possibility and feasibility of a comprehensive irrigation system for the lands thrown open for settlement on this reservation.

Citizens in the Lower Yellowstone valley are showing commendable interest in the plans of the government for the construction of what is known as the Fort Buford irrigation project. Numerous letters have been received from organizations and citizens in the valley urging upon the government the continuance of its work in that section, and indicating that the land owners are generally approving the project and will coöperate with the government in every way to insure its success.

Congressman Dixon has presented numerous petitions and in person has urged the continuance of the work. The Northern Pacific Railroad Company, which owns some land in this valley, has agreed to coöperate with the government to the fullest extent, and will dispose of such tracts as are under the proposed canal, under regulations of the Reclamation Act, to *bona fide* settlers only.



Agricultural Land in Forest Reserves. In the creation of forest reserves it frequently happens that small parks or open valleys in the mountains are included, and that these are desired by individuals for stock ranches, or for cutting wild hay, or for similar agricultural purposes. The argument is made that such agricultural lands should be excluded from the forest reserves, and that the boundaries should be drawn along the narrow valleys extending up into the mountains.

As a general proposition, it is agreed that agricultural lands should be ex-



HON. ELON R. BROWN,

STATE SENATOR FROM THE THIRTY-FIFTH NEW YORK DISTRICT.

Senator Brown has been conspicuously active in the legislature this year in forwarding measures looking to the welfare of New York forests.

cluded from forest reserves, but there is a side to the question which is frequently overlooked by those advocating the exclusion of such lands. As a rule, these areas are at high altitudes and are useful mainly for producing wild hay. The little mountain streams can readily be diverted upon these lands, the water spread over the surface, and forage crops obtained.

Some of the water thus applied finally returns to the stream by percolation, and serves to maintain the summer flow, but from one-half to two-thirds of it is lost by evaporation, and the little tributaries which swell the main stream are practically cut off. In case of a river whose flow is entirely appropriated for the use of lands in the lower valleys, this results in very serious losses. For every acre of

wild hay irrigated in the mountains, there is lost the higher-priced product of an acre of far better land in the valley.

This condition is being gradually recognized, and less weight is given to the cry of those who would exclude all agricultural lands from the forest reserves. The streams of the arid region have far greater value in the development of the low-lying lands in the broad valleys at the foot of the mountains, and their waters should be conserved in every possible way, not merely to protect the prior rights, but because such lands have greater economic value to the whole country.

The officers in charge of the designation of boundaries of forest reserves must bear in mind these conditions and give less heed to the demands for exclusion of these high agricultural lands, if by so doing they will jeopardize the rights and needs of the better lands at the foot of the mountains.



Selecting Supervising Engineers.

The public has only just begun to appreciate the stupendous character of the work of the Reclamation Service in the construction of some of the largest dams and canals in the world. Difficult problems of construction confront the engineers, problems involving new and unsolved questions and presenting physical features as yet little understood.

Manifestly only engineers of broad training and wide experience in actual construction in the West are competent to supervise and direct these great works. The selection of the supervising engineers of the service, whose entire attention must be devoted to the important work of construction, is being made with particular care, after full consideration of all the requirements. These engineers must supervise the district engineers and see to it that each is provided with necessary advice and assistance from the consulting engineers. It is appreciated that no man could cover the whole ground and do justice to the important work, and therefore a number of supervising engineers are employed, the territory of each being designated

in accordance with the needs of the service.

For California and adjacent areas Mr. J. B. Lippincott, of Los Angeles, California, is the supervising engineer. He has had wide experience in matters pertaining to planning and the construction of systems of water supply, and is thoroughly familiar with the conditions prevailing upon the Pacific coast, having been consulting engineer in a number of important projects.

For the Northwest in general the supervising engineer is Mr. Hiram N. Savage, formerly of southern California. Mr. Savage has had to do with the construction of the largest dams built for water storage for irrigation in the United States.

For Arizona and adjacent areas the supervising engineer is Mr. Arthur P. Davis, whose name is familiar throughout the West. Mr. Davis designed the principal works for the great storage reservoir on Salt River, Arizona, ranking among the foremost of such works in the world.

Other supervising engineers are being provided as necessity arises, the sphere of control of each being adjusted so that no one man may be overloaded with the engineering details.

The various engineers and assistants are selected and assigned to duty in accordance with their skill and experience, and after careful study of the necessity for each man given by the supervising and consulting engineers. Great care is taken to see that no more men are employed in the Reclamation Service than are actually needed for present examination and for future construction.

By providing these safeguards and distributing the responsibilities among well-known and efficient engineers, it is believed that the deserved confidence of the people and of Congress can be retained and the best results secured at the least possible outlay. Chief Engineer Newell's care along this line is typical of his handling of the reclamation work from its inception. The result is that the work has gone forward rapidly and effectively, thereby disappointing the various critics who at the

beginning were so ready to predict failure for this important public service. The farther it goes the more thoroughly we are convinced that it is in the right hands.

To Examine District Engineer T. A. Noble, of the Reclamation Service, at Spokane, Valley.

District Engineer T. A. Noble, of the Reclamation Service, at Spokane, Washington, has been instructed to proceed to make the necessary investigations at the earliest possible date concerning the development of the Yakima Valley, to ascertain whether the opportunities for irrigation works there are of such a character as to warrant the beginning of a large government work in this valley.

The investigation will be for the purpose largely of securing a better knowledge of the physical conditions of this region. The Department at this time is not fully informed as to the extent to which development may be carried, the general location of the irrigable lands, or the character of the ownership of these lands, whether public or private.

Looking to Oregon's Greatness.

F. M. Chrisman, of Silver Lake, Oregon, describing the numerous natural advantages of the Northern Lake country and urging its early consideration by the engineers of the service.

Mr. Chrisman describes this region as one of unusual attractions and presenting numerous favorable sites for the construction of irrigation works. He calls attention to the fact that the water of Summit Lake, Davis Lake, and the upper waters of East and West Deschutes can be readily diverted to a very large area in that section of the state. He believes each of these lakes can be readily formed into a large storage reservoir, furnishing an ample supply for the irrigable lands under them.

According to Mr. Chrisman, the benefit derived from such a government work would be to make homes for at least 10,000 people, and make productive an immense area of arid land now

practically worthless. As the lands of the proposed forest reserve in this region are to be definitely settled this summer, he deems it advisable that a preliminary investigation should be made at once in connection with the forestry work. Mr. Chrisman believes that under the impetus of a government work the Northern Lake region would be the center of the whole state in the near future. It is a natural alfalfa country wherever water can be placed on the sagebrush plains. Barley and oats yield abundantly when irrigated, and the growing of fruit has proved successful.

An investigation will be made early this season by the government engineers to determine the feasibility of constructing a large irrigation work there.

In Oklahoma. In the furtherance of its promise to thoroughly investigate the possibility and feasibility of government irrigation works in Oklahoma, the Reclamation Service has ordered Hydrographer Russell to establish gaging stations in the western part of the territory, at Kenton, Beaver City, and such other points in that vicinity as are best suited for the purpose on the Cimarron and Beaver rivers.

Gift to Forest School.

The University of Michigan has received from Mr. Arthur Hill, of Saginaw, one of its regents, a deed to 80 acres of land near Ann Arbor, the tract to be known as the Saginaw Forest Farm. Besides being admirably adapted to seedbed, nursery, and model plantation work, the farm contains a small lake well suited to furnish the water required by the University, should this ever become desirable or necessary. It is intended that work shall begin on the farm during the coming spring. This beginning effort will include: (1) The planting of a considerable variety of trees in order to test their adaptability to this region. (2) The starting of a number of seedbeds to demonstrate seedbed methods to the classes in silviculture, and also to serve as object lessons to the many visitors interested in

forest improvement. (3) A number of model plantations of both conifers and hardwoods to serve as demonstration areas for the students. Upon these areas will be shown the results of various methods of planting, as well as more advanced silvicultural operations, such as cutting the hardwoods at the end of their first, second, or third year in order to discover the best time to set them to sprout for post and pole timber.

The tract contains a great variety of soils and topography, including good wheat land, poor gravel, and gullied soils, and for this reason it is one of the best adapted locations which can be found anywhere in this vicinity for the purpose in view.

Inasmuch as a large part of Michigan's forestry work must of necessity consist of the re-establishment of the forest rather than the care of existing woodlands, the Forest Department of the University, and with it the whole State of Michigan, is to be congratulated on this admirable and timely gift by one of its most liberal and thoughtful men. This generous gift might well be imitated by others in Michigan, as well as elsewhere. Large areas of waste lands have reverted for taxes or are otherwise useless to their owners. Why not turn them over to some safe institution for forestry purposes, and thus have them render the double service of growing valuable material and at the same time of assisting education in a direction so much needed at the present time?

Mr. Hill is an indefatigable worker in the interests of forestry, especially with a view to improving conditions in his own State of Michigan. He has for several years been rendering most valuable service as a member of the Michigan State Forestry Commission and the American Forestry Association.



Hydro-Economic Studies.

A forthcoming report of the United States Geological Survey will contain valuable data concerning the use of water in the manufacture of paper.

The strawboard investigations show

that the relation of strawboard waste to water supply is particularly strained in the States of Ohio, Indiana, and Illinois. The object of the investigation made by the survey in Indiana was to bring the strawboard company to a realization of the fact that the enormous waste of the valuable cellulose which is carried away and causes trouble is unnecessary, and that pollution by strawboard waste can be removed if the method of strawboard manufacture is changed. The valuable materials which are now carried away in waste waters to the pollution of the streams may be retained and converted into strawboard.



Not Unusual The World's Fair Commissioners for the State of Oregon have secured a large fir log from Clatsop county. It is by no means an unusually large tree, although it measures nine feet in diameter at the butt. The section sent is 28 feet in length, scales 12,000 feet of lumber, and weighs 46,750 pounds. The tree was 431 years old and measured 200 feet to the first limb.



Important Experiment Station.

The United States Department of Agriculture has decided to establish a Plant Introduction Garden and Experiment Station at Chico, California. Contracts for the necessary land have been closed and work has been begun on what will undoubtedly be the greatest institution of its kind in America and perhaps in the world. A beginning will be made with ninety acres, but it is the intention of the department to extend the area as the needs of the institution require. The garden will be devoted to experimental culture of the plants introduced from various parts of the world, and to a careful study of plant life.

Such an institution has long been contemplated by the Department of Agriculture. California was selected for its location on account of climatic conditions, which admit of the culture of tender plants from the tropics and of northern products as well. The ideal

location for such an institution is that which admits of the successful cultivation of the widest possible range of products, and the commission intrusted with the duty of selecting the site believe they have found it at Chico.

This commission was composed of Prof. P. H. Dorsett, government expert, who will have charge of the institution, and Prof. A. V. Stubenrauch, of the University of California. They spent months in making a careful study of conditions affecting plant life in various portions of the state, visiting and carefully inspecting each locality likely to prove available. The decision in favor of Chico was reached sometime ago, but the site selected could not be secured and another tract had to be chosen, which has now been done and the purchase consummated.

Chico is situated near the eastern border of the great Sacramento Valley, 75 miles north of Sacramento, the state capital, and was the most northerly point considered by the commission. Climatic conditions in California are affected but little, if at all, by conditions of latitude, the orange, the lemon, and the olive being staple products of a district that measures fully 500 miles north and south.



California Hydrography. The stream-gaging work of the U. S. Geological Survey, in coöperation with the State of California, is under the charge of Mr. S. G. Bennett, engineer, whose headquarters are in the Rialto Building, San Francisco. Between forty and fifty river stations are being maintained and daily records of flow kept. These extend from the Oregon line to Mexico, and cover all the principal streams of the state. In addition, an extended series of low-water measurements of the mountain tributaries or streams is made annually.

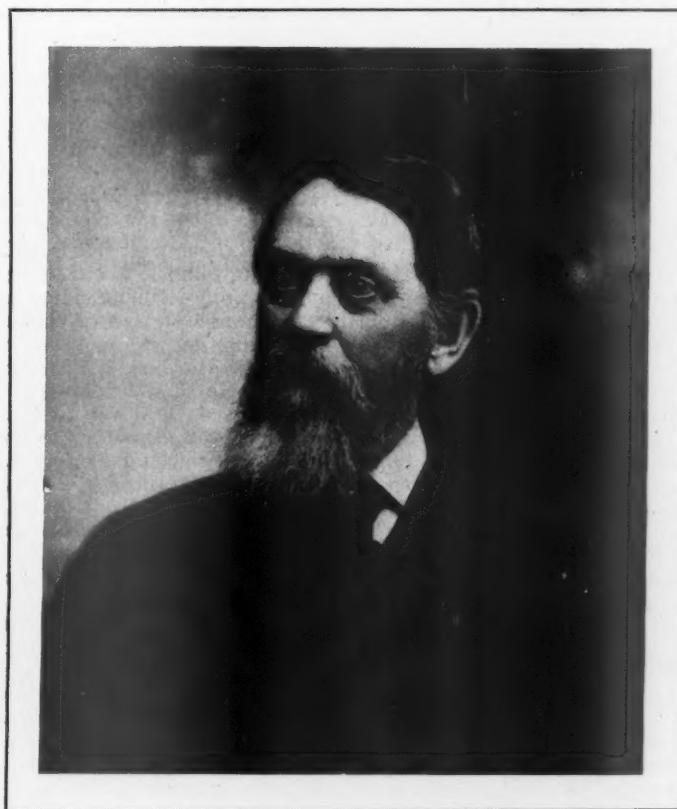
During the past year a publication entitled "California Hydrography" has been issued by the Geological Survey. This contains 500 pages of closely tabulated records of stream flow observed in the State of California, and contains not only the records of the Geological

Survey, but all of the data that is available from any other source bearing on this subject. It also contains records of the evaporation, floods, discharge, etc. The rainfall in the higher mountains of California is given particular consideration, and records of rainfall stations at elevations above 1,000 feet are presented, together with a map showing the estimated position of the rain curves of the state.



Public Service. Apropos of a bill that was before Congress this winter asking for an appropriation of one million dollars to be used in the erection of a building for the United States Geological Survey, some ill-informed newspaper correspondent has been lamenting the extravagance of Director Walcott in appointing Mr. George F. Kunz to be "Radium Commissioner" at the Louisiana Purchase Exposition. His lamentations have so reverberated through the country press that it seems only fair to Director Walcott, Mr. Kunz, and the public to explain that Mr. Kunz is giving his services as a radium expert to the Survey and the nation without any expectation of reward except that which may come to him with the consciousness of good citizenship. It behooves the critics to inquire first whether they may not be maligning their own benefactors before they begin to rail at officials for appointing "commissioners to exploit solum, the X-ray, liquid air, bottled sunshine, paleontology, and balloony."

Even a million-dollar building is not the extravagance it may seem to be. The twenty-fourth annual report of the Director of the Survey shows that the Survey was obliged to expend the considerable sum of \$28,400 for office rent during the fiscal year from July 1, 1902, to July 1, 1903. One does not need to be an expert bank accountant to calculate that under the operation of the principles of compound interest the government might to-day be the richer by the value of its building had it erected a million dollar structure for the use of the Survey when that bureau was first established, a quarter of a century ago.



DR. JOSEPH TRIMBLE ROTHROCK,
COMMISSIONER OF FORESTRY FOR PENNSYLVANIA.

PENNSYLVANIA is the first of our states to adopt and put in operation a rational forest policy. The people and the law-making body of the state are thoroughly in sympathy with the idea and act in unison. This highly desirable state of affairs is in a great measure due to the ability, tact, and great public spirit of Dr. Joseph T. Rothrock, who has been Commissioner of Forestry since the creation of that office. He has devoted himself unselfishly to this great work, and the best evidence of his success is the general confidence he has won from the public and the free hand he is given in forest matters by the state authorities. Dr. Rothrock was born at McVeytown, Pa., on April 9, 1839. He graduated at Harvard with the degree of Bachelor of Science in 1864, and received the degree of Doctor of Medicine at the University of Pennsylvania in 1867. Dr. Rothrock was captain of Company E, 20th Pennsylvania Cavalry, during the Civil War, and was wounded at Fredericksburg. In 1877 he was appointed Professor of Botany at the University of Pennsylvania. He is the author of "Vacation Cruisings," "Botany of the Wheeler Expedition," "Flora of Alaska," "Revision of North American Guarineæ," Proceedings of the American Academy; and Pennsylvania Forestry Reports, 1895, 1896, 1897. He has from the first been one of the most active promoters of the Pennsylvania Forestry Association, which organization includes in its membership several thousand of the most public-spirited citizens of the state, and which has been a great factor in moulding public opinion in connection with forest matters.

THE AMERICAN FORESTER AT WORK.

A NEWCOMER IN OUR NATIONAL LIFE WHO
HAS ONE OF THE MOST VITAL INTERNAL
PROBLEMS OF THE COUNTRY TO SOLVE.

BY

ROBERT V. R. REYNOLDS.

THE forester is a newcomer in the field of American workers. Although a number of articles with regard to his work have been published from time to time, the majority of people across the country have as yet only vague ideas in regard to the qualifications required for satisfactory performance of his duties, or what he actually does when in the field.

The need of men thoroughly trained and competent to handle the problems of this new profession has been realized in America for only a few years, and it has found Americans very meagerly prepared to take up the heavy task of properly handling their forests with regard to the necessities of the present and coming generations. With only one or two exceptions, the men who stand in the first class today have been trained abroad, and can be counted on the fingers of both hands. Next to them in preparation we find perhaps sixty men who have had considerable training in American schools and several years' experience under the guidance of the men first mentioned. There are as many more who have had either the training or the experience, but not both. Finally, there is a number of well-educated men who have a smattering of the subject gained through slight experience and reading. Altogether, the really useful men count up to little more than 200 in the states and the Philippines.

The requirements are severe. As in other kinds of engineering, a man may do good work in the schools and be worth very little until he has had experience, or else upon taking up practical work he may prove to be lacking in the requisite push or stamina, or those essential qualities which alone can put theory into practice.

There are at least five qualifications which are valuable to a man who takes up this profession, intending to make it a thorough success in future years, taking into consideration the competition which is about to commence.

First. He should be of sound body, fair habit of health, and temperate, otherwise the exposure, fatigue, and privations which he is very likely to encounter will bring his activities to an untimely end.

Second. He should be a college graduate.

Third. He should be a graduate of a forest school.

Fourth. He should have the widest possible experience, at least in temperate regions, including a tour of inspection through the instructive forests of Germany and other progressive European countries.

Fifth. He *must* have good, practical common sense, or all the rest is worth but little.

While it is not practicable to insist upon all these qualifications at present, there is little doubt that they will some day be much more rigidly demanded than now. In fact, the signs of the times already indicate such a state of affairs, especially in the government service.

A very large majority of American foresters are in the government service. The Bureau of Forestry of the U. S. Department of Agriculture has been the training school which has developed a great many useful men by the drill of practical work. The forest schools recently established have contributed much to the personnel of the Bureau, but can not give that final test of actual service which alone can determine a man's value and make him efficient and self-reliant.

Under these conditions it is very natural that the forest schools have acted to a large extent as feeders for the government service, and have patterned their courses according to the needs of the Bureau as developed in actual service all over the United States, and it follows that with a few exceptions the Bureau operations hereinafter described are typical of similar work as carried on by all foresters in the country.

The European forester, with centuries of precedent to guide him, is at a great

The European's very weight of learning would militate against him if he were confronted by a task such as the American is now beginning. He has never been compelled to face entirely novel conditions. By long habit of following rules, his methods have taken on the mechanical exactness of his checkrowed woodlands and the comparative absence of need for progressive thought in latter days has resulted very much as might be expected, with some brilliant exceptions.



FORESTERS' CAMP IN IDAHO.

advantage, so far as his work is concerned, compared with his American cousin. His work was an exact science long before he was born. He has only to consult the authenticated records of thorough and comprehensive forest study to obtain data which might cost the American months or years of investigation. As a consequence he can make accurate predictions, which reduce business risks to a minimum, provided he is not asked to go outside of his own bailiwick. At this point the disparity ends.

The Yankee, on the other hand, is the same energetic, inventive pioneer that his great-great-grandfather was before him. Lacking in many cases the erudition of his trans-Atlantic prototype, he attacks a new set of conditions with mind unhampered by dogmatic opinions of what must necessarily be done, and he is going to succeed in the gigantic task before him through adapting his methods to circumstances. These statements are intended neither as derogation of the one nor flattery of the other, but as an expression of recognized facts. Each

man is more successful in his own work than the other probably could be.

The forest work done in this country has gone far enough to show the necessity for an American system of forestry based upon sound principles and thorough knowledge of their local application. Forestry in America differs* from forestry in Europe in details and policy, just as does forestry in India. European forests are rich in suggestion for American foresters, but the effort must be to build up an American forestry in harmony with American conditions, rather than to apply, under these conditions, a form of forestry which is the direct result of local factors fundamentally different.

The United States is not only a virgin field to the forester, but also an extremely difficult one.

It is impossible here, as might happen under a strongly centralized government such as Germany has, to remedy the faults of our forest policy promptly

* The American work which most closely approaches the European idea of forestry is the preparation of plans for management of wood-lots.

and efficiently by law. Our President deplores the injury that is constantly being done to the national interests, but can not prevail against individual selfishness and ignorance, provided there is enough of it to block the ways in Congress.

The great extent of the country multiplies the difficulties, both on account of the enormous area and the variety of climates to be found. Each region has its own peculiarities of timber and growth resulting from myriad combinations of latitude, altitude, and rainfall, varying from tropical to arctic, from the line of eternal snows to points below sea-level, and from practically no precipitation to more than 100 inches annually. Counting in the Philippines, the total list of woody species amounts to more than 1,200, of which at least 135 are merchantable.

Naturally the study of such a mass of material and the establishment of scientific treatment of merchantable forests on such a territory can only be attempted by some such organization as the Bureau of Forestry. There are two such bureaus—one in the Philip-



INITIATING A NEW MAN. SOUTH DAKOTA.



COUNTING RINGS OF ANNUAL GROWTH WITH A LENS.

pines and one at Washington—under different departments and having no official connection. An explanation of the work of the tropical bureau was given in FORESTRY AND IRRIGATION for April by Mr. Wilhelm Klemme.

The work of the Bureau at Washington is divided conveniently as follows: Into preparation of working plans, surveys of forest reserves, the extension of forest areas by planting and otherwise, and investigation of forest products. Each of these branches of work corresponds to an official division of similar name.

The most extensive branch of activity is the preparation of working plans for large tracts of forested lands. A working plan, it may be said, is a carefully thought out scheme for the treatment of a specified area of woodland, based on a study of past and present conditions of growth and designed so to supplement and aid natural conditions that the forest shall continually produce and yield the largest quantity and the best quality of wood possible.

In order to make such a plan, two main facts must be ascertained—the

present amount of wood standing and the amount of increase by growth each year.

The observations which must be made are of two kinds, known as forest surveys and stem analyses.

By means of the former the diameter of the trees on about one-twentieth of the total area is actually measured with large calipers. All the trees are calipered 33 feet on each side of compass lines run across the forest, either parallel or in a zigzag manner from one side to the other. Caliperings thus for a mile along the line covers 8 acres. From such records may be obtained an average of the entire area, which is believed to vary by not more than one-tenth from the actual stand. Wherever the compass lines cross streams, strike the edge of the timber, or traverse slopes, notes of the distances are taken, which are the data by which a very fairly accurate timber map is drawn.

Attention is also given to the value of streams for driving, the chances for splash-dams, camp sites, railways, and roads, and a mass of information is thus collected which may prove of the greatest

assistance in directing logging operations. In taking stem analysis the men need to have the trees felled and cut into logs. For this reason they follow up the loggers at work whenever possible, although sometimes they have to cut and section the trees for themselves. First they count and measure the rings of annual growth on the stump or the butt log to learn the age of the tree and its rate of growth in each decade of its life. Sometimes, especially in hardwoods, the

contents of an average tree and multiplying by the number of trees ascertained from the surveys.

The mass of wood which a tree adds to its bulk during any period of its life may, for practical purposes, be considered as a hollow truncated cone. The volume of this conical tube of wood may be obtained by calculating the volume of a solid truncated cone of the same dimensions and subtracting from it the volume of the similar interior figure



FOREST RESERVE WORK IN THE ROCKIES.

rings are so closely crowded that a lens must be employed to distinguish them.

The height of the stump, length of each log, and the length of top added together give the height of the tree. Diameters are measured at each place where the trunk is sawed through, and the thickness of the bark is noted, so that a vertical median section of the tree could be drawn to scale if necessary, and the actual quantity of wood in the trunk can be closely calculated. From these figures the amount of wood in the whole forest can be estimated by calculating

whose base is measured on the stump by the annual rings extending from the heart of the tree to the inner side or beginning of the growth period under consideration.

Thus it may be ascertained at what year of its life the tree ceases to pay good interest, in wood, on the value of the space it occupies. It should not be allowed to stand after reaching that age, and it may be gainful to cut it sooner under some conditions. In this way the plan can name the diameter below which trees should not be cut, in

order to make the most gain in the long run, and also foretell after how many years the tract can be cut over again and supply the same quantity of timber. The plan usually arranges to leave a certain number of mature trees on each acre to seed the new crop, and regulates the amount of grazing permitted and precautions against fire, which latter is one of the most important points.

the utmost skill and write an excellent prescription, but the latter will be of little use to the average layman, or may even do him injury, unless he has the drugs compounded by a pharmacist who can interpret the hieroglyphics intelligently. The two cases are not exactly analogous, for the plans are put in as plain, direct English as possible. The trouble is that years of study are



PREPARING TO ANALYZE A LODGED TREE IN WASHINGTON.

Preliminary examinations are also made of limited areas, such as the military reservation at West Point, in which recommendations for treatment rest upon an inspection by a skilled man, no surveys or analyses being taken. The ultimate success of the recommendations arising from either the calculated working plan or the preliminary examination depends to a large degree upon having a thoroughly competent man to mark the trees to be removed. A physician may diagnose a case of disease with

needed to fully comprehend the ideas of forestry and to modify them to special circumstances in practice.

The working plans men go to all forested states and territories. They pitch their tents in the southern pines in winter and in the northern or far western states during the summer and fall. In the south they flounder through the gloomy swamps of cypress and black gum, nourished by the traditional hog and hominy and made nimble of foot by occasionally running upon a moccasin.

casin or water-rattler coiled on a tussock, or hearing the long-drawn bellow of an alligator. Some of the men use revolvers or rifles, and whatever game is secured serves to break the monotony of camp fare.

The southern pines yield pitchy heart-wood, called "fat-wood" by the natives. This makes cheerful camp-fires, albeit somewhat smoky. With good company of an evening and dry blankets, the men can afford to make light of the daily soakings. On the pine lands the work is pleasant enough, and caliperizing is probably seen at its best, as many as 80 acres having been covered in a day by one crew under favorable circumstances.

In the north and west mosquitoes and black flies are a pest in early summer, and the caliper-man meets exhausting obstacles in the way of steep, rough mountain sides and dense swamps of tamarack, so thickly grown up with

saplings that it is well-nigh impossible to keep track of the ones calipered; but the risk of disease is less than in the south, for the water and food are of far better quality.

For several years back, during the summer, a number of Bureau agents have been engaged in inspecting the forest reserves in the western third of the United States. They have also examined tracts of the public lands in this region with regard to their suitability for reserves, both on the ground of timber resources and from the standpoint of conserving the water supply about the sources of streams which supply the adjacent country for irrigation or other purposes.

The men who do this kind of work ride alone or with a native guide through the mountains, carrying the necessary camping equipment on pack-horses, and thus being entirely free to visit any and all accessible parts of the territory.



CALIPERING CYPRESS AND BLACK GUM IN THE LOWLANDS OF SOUTHEASTERN MISSOURI.



FOREST EXTENSION IN NEBRASKA. HELPING THE GRUB WAGON ACROSS THE PLATTE.

They note the topography, course and flow of streams, species, quantity, and location of timber, and obtain all possible information with regard to mining and grazing matters, so important in the western country.

Available agricultural lands are also noted, and when possible excluded from reserves, for it is not intended that the reserves shall hinder any useful and lawful industry, but rather benefit the greatest number possible.

Upon the recommendation of the Bureau agents, large tracts have been temporarily withdrawn from settlement, some, or parts of which, have been made permanent reserves, and the remainder again thrown open to settlement if its nature proved to be such that it was not necessary or desirable to make a reserve of it.

The men of the Division of Forest Extension do a number of different kinds of work. Some visit citizens who request advice, inspect their land and locality, and then offer the best suggestions the experience of the division has to offer for successful planting of forest trees.

Others are now at work in Nebraska planting jack-pine and other well-

adapted species on the great Sand Hill country. They grow the seedlings in seed beds from seed previously gathered in Minnesota, South Dakota, Wyoming, Arizona, and other favorable localities, and when the seedlings are large enough, set them out where they are expected to grow. Down in the California mountains the slopes denuded by fire or otherwise are being planted with tree seeds.

The study of forest fires is a negative means of forest extension. On this work the investigators either work from the point of view of the scientist or that of political economy. In one case it is to find just how the fire burns and progresses, and its effect on different species, and how it can best be checked.

The other man looks everywhere for the causes that started fire, the amount of loss, actual and involved, studies fire laws, and reports what changes ought to be made to remove the causes and decrease the loss.

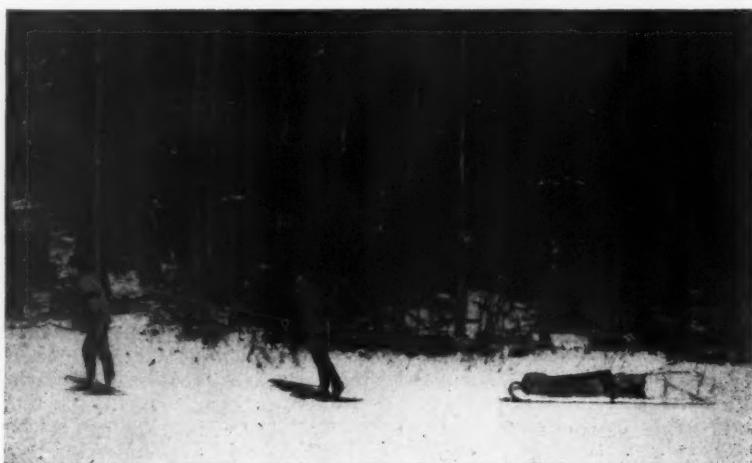
Then there are the forest-products men, who work both in laboratories and out of doors. In the laboratories they test the strength of different kinds of wood and experiment with various preservative processes intended to lengthen

the life of railroad ties and telegraph poles. The ties are laid in regular track and closely watched to note the effect of the preservatives used. This is work of great value, since it may be able to replace the oak and longleaf-pine ties with chemically treated beech and other less expensive species.

In all kinds of work the men carry cameras, and are encouraged to photograph matters of interest freely. A report is doubled in value when backed by a good series of intelligently selected views.

But it is not in the Federal service alone that opportunity is offered to the

The most prominent example of private work under a trained man is that of the Biltmore estate of Mr. George Vanderbilt, near Asheville, North Carolina, which is administered along the lines laid down by a working plan under the direction of Dr. Schenck, who also conducts the work of the Biltmore Forest School. More and more the great pulp and logging companies, and the railroads, and manufacturers of hardwoods are seeking the advice and services of expert foresters in carrying on their woodland operations. They pay good salaries and will pay better later on when their need becomes a little more



FORESTERS TRAVELING ON SNOWSHOES IN THE ADIRONDACKS, NEW YORK.

thoroughly trained forester. It seems likely that for many years to come there will be a demand for men who have shown themselves sufficiently capable in the Bureau work to merit official approval and recommendation.

Very recently two such men have been employed in responsible positions, one as forester of the Territory of Hawaii and the other as forester to the State of Wisconsin. New York, Pennsylvania, Connecticut, New Hampshire and Michigan also have foresters looking after their woodlands, who did not, however, pass through the course of government training.

generally evident. Business men of the past century are apt to think that hiring a forester is a piece of useless expense—a twentieth-century fad. They got along well enough, they say, and looked after their own woodlands. But the times are changing rapidly. The good old days of big, free timber and small population have gone by forever. Henceforward it is to be always more and more intensely a question of stoppage of waste, of getting the most out of the soil, of securing the fractional margin that was almost despised 30 years ago.

The scientific methods of the forester are the only means that can save the

day, and the sharp-witted modern business man knows it. In good business nowadays nothing costs too much, provided it pays for itself and brings a reasonable surplus of profit. It is not hard to believe that 20 years from now foresters will not be stared at in curiosity when the nature of their occupation is

announced. They will be as much a part of the settled professional world as the doctors, and lawyers, and engineers now are, and, should they suddenly be removed, business interests would feel their loss quite as much as they would the disappearance of some of the others.

THE BIGTREES AND FOREST FIRES.

BY

G. FREDERICK SCHWARZ.

THE bigtree (*Sequoia washingtoniana*) of the Sierras is singularly free from most of the ills that threaten forest trees. It is known to be practically proof against the attacks of insects and fungi. It is windfirm, notwithstanding its flat root system, for its roots extend in a wide circle about the tree and its bole is amply proportioned and well balanced toward the base. Moreover, the crown in mature specimens is comparatively narrow, and is rounded at the top, thus affording only slight leverage in storms. The tops of old bigtrees are sometimes shattered by lightning and occasionally one is broken off in a severe gale, but the injury is rarely serious. New branches and foliage spring up and cover the old wounds.

There remains the common scourge of all forest trees, the forest fire; but it is generally understood that even fire is less harmful to the bigtree and its near relative, the redwood, than to other trees. The thick, spongy bark, which effectually protects the wood, is free from pitch and not very combustible; nor is the wood itself easily burned when exposed, at least in living trees. Nevertheless, many old trees are severely burned at the base. Repeated fires, fed by dead branches and other combustible material at the foot of the tree, finally eat their way through the bark and into the heartwood. Sometimes fire attacks the tree from several sides, and as the injury enlarges inward it may meet with a similar excavation

from the opposite side, and thus form an opening through the middle of the tree. Occasionally the stubs of former branches, or bruises on the trunk, cause the fire to spread higher up the sides. In one of the trees of the Mariposa Grove, the interior of the trunk has been hollowed out by fire all the way from the base to an opening near the top, a distance of about one hundred feet, which has suggested the appropriate name of the Telescope.

Although a large number of bigtrees have thus been burned more or less severely by forest fires, their vitality has been rarely if ever seriously affected; the communication between crown and root system has generally been sufficiently maintained for a continuance of the vital processes of growth; but the fires have caused another kind of injury which, so far as the writer is aware, has heretofore been overlooked. Around the foot of an old bigtree may sometimes be seen a large, circular mound covering the bulging roots and formed by the accumulated débris of twigs, cones, shreds of bark, and needles that have fallen for centuries. These mounds apparently serve a useful purpose in protecting the root system and regulating its supply of moisture. The copious winter rains and the melting snow do not readily seep into the ground close to the bases of the old trees, but the water flows away to the outer parts of the extensive root system, where it is most needed. Most of these

mounds, however, have been partially or even entirely destroyed by fire, and thus the water has found easier access to the middle. By the destruction of the mound, moreover, the tree is deprived of a large amount of fertilizing material, which would otherwise gradually be supplied in solution to the underlying root system.

Lastly, although the trees in being burned are not injured in any way physiologically, they are indirectly harmed and their life is endangered by the change in mechanical conditions caused by the large excavations at the base. These excavations often extend over so large a part of the circumference that considerable sections of the root system are severed from the tree, thereby weakening its principal means of support in severe winds or storms. The burn often extends so far inward that the equilibrium of the tree is also endangered. There is strong reason to believe that this undermining of the butt and weakening of the natural anchorage is the ultimate cause of the fall and death of most bigtrees. Some day the enormous column is rocked out of its center of gravity and wrenched from its natural cables. Almost all the large, recently overturned trees will be found to have extensive fire scars at the base and the remains of a flat root system, considerably reduced in circumference by breakage.

It has always been an interesting

question whether the Sequoia groves, that have been so much admired and marveled at ever since the time of their discovery, were approaching extinction, or whether they were able to hold their own in spite of gradual climatic change and unforeseen vicissitudes. It is generally admitted that while the southernmost groves show some indications of a perpetuation of the species in the occurrence of a young growth of seedlings and saplings, reproduction in the northern groves is much less promising; but it is not certain how far this is attributable on the one hand to climatic conditions, and on the other to the various interferences by man, such as the lumbering of some of these groves and adjoining forest areas, grazing by sheep, and repeated forest fires. The question of reproduction and its bearing upon the future of this remarkable tree has been touched upon from time to time by various observers* with interesting and valuable results. This is a wider question. In the present note the writer has ventured merely to direct attention to the importance of protecting the older trees against forest fires, on account of certain harmful results which have apparently heretofore escaped observation or been insufficiently emphasized.

*See "On the Post-Glacial History of *Sequoia Gigantea*," John Muir, in *Proc. Am. Assoc. Adv. Sci.*, XXV, pp. 242-253.—George B. Sudworth in Bulletin 28, Bureau of Forestry, U. S. Department of Agriculture, p. 20.

SEARCHING FOR WATERS UNDERGROUND.

INTERESTING WORK NOW BEING CARRIED ON IN SOUTHERN CALIFORNIA BY THE UNITED STATES GEOLOGICAL SURVEY.

SOUTHERN California, a unique region, most widely known, perhaps, for its climate, its oranges, and its beautiful and hospitable homes, is rapidly becoming a winter playground for the people of the United States and Canada. Among the features which make it most attractive for the traveler of means or of delicate health are its constant sunshine and clear, dry air. These necessarily mean a limited precipitation and

semi-arid climate; so that while our eastern states receive of rain or snow fall from 30 to 50 inches of water, distributed throughout the twelve calendar months, the valley of southern California receives from 10 to 20 inches, practically all of which falls in the winter months, from November to April. While this assures an abundance of bright days, it does not furnish sufficient moisture to mature ordinary crops on the rich soil,

which is capable of abundant yields when properly tilled and irrigated. The deficient rainfall taxes the ingenuity and energy of the enterprising citizens of the state, and they have developed and conserved the available water supply more systematically here than anywhere else in the Union.

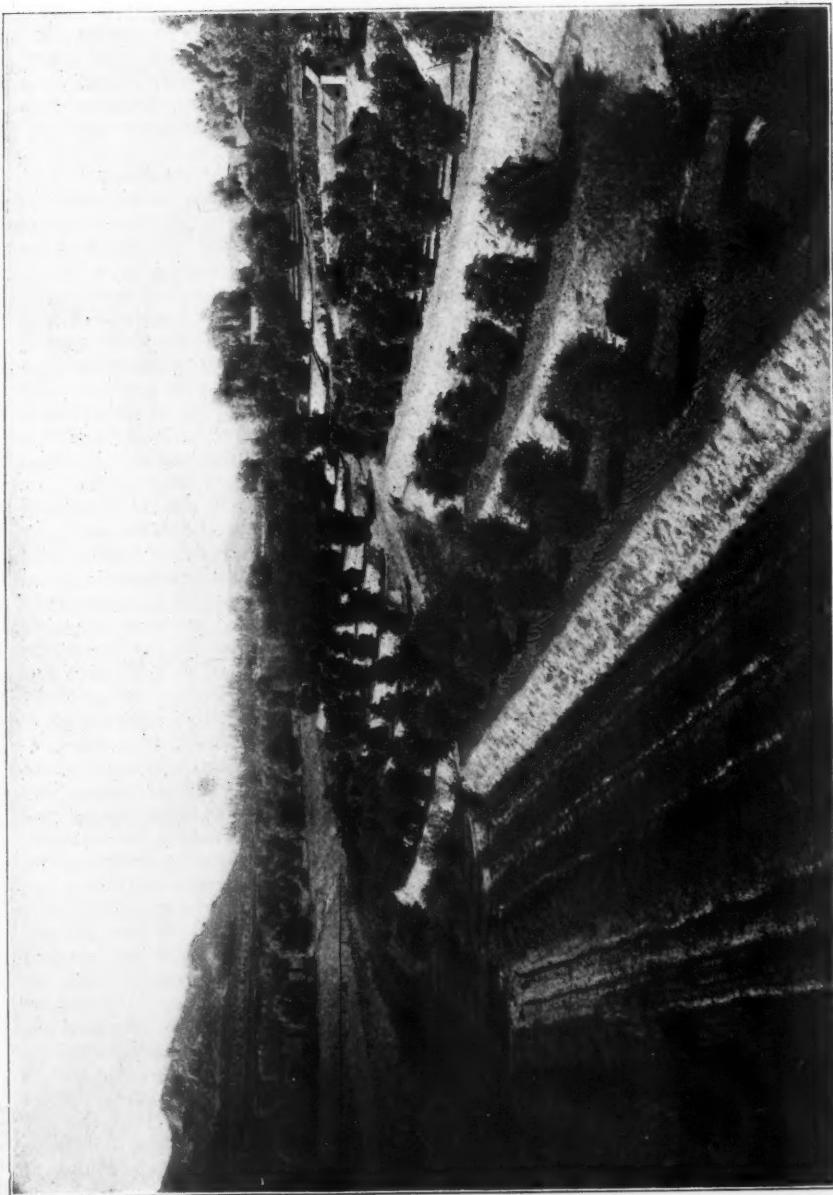
The summits and slopes of the mountain ranges which rim the valleys, condensing the moisture from the Pacific winds, receive the most abundant rainfall. The streams draining these slopes carry the water to the tillable lands of the valleys, where it is diverted directly into the main canals of the irrigating systems, often after being used several times in generating electric power, or it sinks into the alluvium which partially fills and underlies the valleys generally. The excess storm water from the mountains, which sinks into the gravels of the plains and is there augmented by the winter rains of the low lands and the water which returns to the soil from the irrigating ditches, forms an important underground source of supply, which has been extensively utilized of late for irrigation and domestic purposes. It is this source of supply, its quantity, quality, the laws governing its distribution and circulation, and the manner and extent to which it is being developed, as well as the future possibilities, that are being considered by means of an interesting and important series of investigations now being conducted by the western section of that branch of the Geological Survey known as the Division of Hydrology.

In the course of this investigation, upon which a party of scientists is engaged under the direction of Mr. W. C. Mendenhall, hydrologist, it is estimated that 10,000 wells will be visited, measured, and tested. These vary in character from shallow domestic wells to twelve-inch bores, 1,000 feet in depth, which yield 100 miner's inches or more of artesian water. They are distributed from the head of the valley to southern California in the vicinity of Redlands, Riverside, and San Bernardino, famous for their orange groves and charming vistas, to the fertile peat lands of Orange county, close to the shores of the Pa-

cific and the beautiful Pasadena and Los Angeles itself. Past developments have recorded a number of artesian basins varying in area and importance, and many thousands of acres of other water-bearing lands, from which a more or less abundant supply may be secured by pumping, tunneling, or other engineering devices.

It is difficult for the easterner to comprehend the vital importance to Californians of the water supply and of everything pertaining to it, or to realize the amount of capital, energy, and skill devoted to increasing and preserving it; but when we consider that by a careful distribution of available water, lands formerly worthless have been given a value of \$2,000 or more per acre, and whole communities with property interests, representing many millions of dollars, have been built upon sterile plains which, without the water brought to them by engineering skill at enormous expense, would be inhabited only by coyotes and jack rabbits, and would yield nothing but greasewood and prickly pear, we begin to understand how intimately the problem of water supply is bound up with the life of the community; or when we remember that in the days of the Padre, and after, of the first Mormon settlers, only the small areas of naturally moist land were regarded as of value, and that these yielded then and yield now only hay and grain, or serve as stock ranges, and compare these areas with the modern, immensely more valuable communities, in which the citrus fruits are raised and the majority of wealthy homes have been established through the development and distribution by engineering skill of the flowing waters from the mountains or the underground waters in the valleys, we may comprehend the intense interest felt by all southern Californians in everything that pertains to the water question; for they, better than anyone else, realize that the life of all the better part of their delightful land depends upon the maintenance of this supply.

There are communities which support enthusiastically the plans of the Bureau of Forestry for the reforesta-



SCENE SHOWING THE RESULT OF TERRACE IRRIGATION AT REDLANDS, CALIFORNIA.

tion of the slopes of the Sierra Madre Mountains, and which fight bitterly the sawmill magnate, who for immediate profit denudes them of their timber cover and paves the way for wasteful floods; likewise they prosecute relentlessly the careless camper who permits his fire to spread into a destructive conflagration. It is in recognition of these strong interests that the present work is being done by the Division of Hydrology on the underground water supply.

The result of this work will be presented to the public in a series of reports, which will contain maps showing the area and distribution of the artesian basins and other water-bearing lands,

with contours of the water planes, giving the depth at which water is to be expected at any point; and purity lines, showing the character of the water, and inferentially its source in some cases. There will also be published a general discussion of the structure of the water basins from the geologic point of view, their character and extent, the circulation of the water within them, its conservation, and, so far as conclusions may be drawn, the lines of safe development. It is expected that one or two of these water-supply papers will be written this coming summer and issued as soon thereafter as possible.

BOISE-PAYETTE IRRIGATION PROJECT.

AN INVESTIGATION BY THE RECLAMATION SERVICE THAT PROMISES TO MAKE A TREMENDOUS ADDITION TO THE PROSPERITY OF IDAHO.

BY

C. J. BLANCHARD.

THE marvelous development of the great West offers an instructive subject for the consideration of every citizen of this country whose interest and pride in his native land extends beyond his own immediate surroundings.

A wonderful impetus is being given to the growth of the arid West by the work of the government under the irrigation act. Uncle Sam's engineers in every Western State are exploring the mountain fastnesses for favorable reservoir sites, hydrographers are measuring the flow of streams, and surveyors are laying out the lines of broad canals across desert wastes.

In Arizona and Nevada construction work has actually begun on systems involving the expenditure of millions of dollars.

Two of the fairest and most fertile valleys in the arid West, the valleys of the Payette and Boise rivers, in southwestern Idaho, are soon to be the scene of a stupendous irrigation work by the government. Three hundred and sev-

enty-two thousand acres, or more than the total irrigated area in Arizona, Washington, or New Mexico, are to be brought under one comprehensive national irrigation project, and fully 270,000 acres reclaimed from sage brush to productive orchards and fields of alfalfa. The 100,000 acres now irrigated in these valleys are to be guaranteed an ample water supply for all time to come. The stored waters of Payette River are to be diverted through a tunnel under a low divide, and together with the restrained floods of the Boise are to be spread over these famous valleys, making possible the building of hundreds of prosperous and happy homes.

The Boise-Payette project is in two sections, the first comprising a masonry dam in Payette River with a canal on each side of the stream, the south side ditch connecting with a large pumping plant. Under this system 1,000 cubic feet per second will be diverted for irrigation to 150,000 acres of land. The dam will be 90 feet high, 450 feet long

on top, 125 feet on the bottom, and the capacity of the reservoir will be 190,000 acre feet. The north-side canal will have a length of 20 miles and the south side 40 miles. The estimated cost of this section is \$1,200,000.

Section number two is a diversion from the Boise River. The works consist of a dam 10 feet high, 400 feet long on top, and 400 feet on the bottom, constructed of concrete, steel, and timber. The capacity of the reservoir is 150,000 feet. Two diversion canals, one on each side of the river, will have a combined length of 135 miles and a bottom width varying from 45 to 90 feet. The estimated cost of the Boise section is \$2,000,000, and the estimated cost of the entire project is \$3,200,000. The actual area to be benefited by both sections is estimated at 372,000 acres.

No other section of the United States presents a more attractive field for the reclamation engineers than is found in these valleys. The lands lie at an elevation of 2,100 to 2,800 feet, the climate is the very best found in the arid region, the winters being moderate and the thermometer rarely reaching zero, and freedom from wind and an unusual number of bright, sunshiny days mark the winter months. The summers are long and warm, and with irrigation promote the most rapid vegetable growth. The soil is rich, productive, and adapted to all the fruits and cereals of the temperate zone. All deciduous fruits and berries produce abundantly, and apples and prunes especially are shipped in quantities to eastern markets, where they bring the highest prices. With a sufficient water supply there is no uncertainty as to the productiveness or adaptability of this region to intensive farming. Cultivated lands on every side similar in nature are ample evidence of their value.

Since the government withdrawals were made under this project more than 13,000 acres have been filed on under the reclamation act by intending settlers. More than 100,000 acres of public land and 60,000 acres of state land are embraced in this area. There is every reason to believe that as soon as the actual construction has commenced every acre of public land under this project will be taken in a single season.

An especially interesting feature in connection with this great work is the fact that its construction by the government means not only a vast increase in the cultivated area of this part of the state, but also the final settlement of the vexing questions and contentions now arising in these valleys from an effort to make a limited amount of water do service on what is practically an unlimited amount of land. It means the passing of the promoter and ditch manipulator and the substitution of the irrigator and business man. It means that in a few years an advancement can be made under this government work that by the unaided efforts of the people would never be possible. It means the laying of the foundation for improved agricultural conditions, for better transportation facilities and industries of every kind. Above all, it means homes and living for a quarter of a million people.

Deep in the hearts of Idaho's mountains the miner's pick is finding the precious metals; in her towering forests the woodman's ax is felling her giant timbers, and soon in her desert valleys, smiled upon by the genial sunlight nearly every day in the year, the grasses will quiver, the golden harvests will bend in the breezes, and orchards will glow with ripening fruit. Of the wealth deep bosomed in her tree-clad mountains or sparkling in the sands of her silvery streams much has been written, but of the greater wealth which lies in her valleys of inexhaustible fertility much will yet be said. These valleys, picturesque and beautiful, fertile and healthful, offer ideal homes and opportunities for winning comfort and fortunes.

The Secretary of the Interior tentatively has approved the plans of the irrigation engineers, and in compliance with a request of the majority of land owners of the Boise and Payette valleys, has ordered a continuance of the surveys and investigations with a view to setting aside a sufficient sum for the completion of this important work as soon as the settlers perfect the necessary organization to secure to the reclamation fund the return of the money required for the construction of the work.

The average size of irrigated farms in this section of the state is 40 acres. The average value per acre of irrigated land, according to the last census, is \$58. The value of farm property per farm is \$2,060, including buildings, implements, machinery, and live stock. The gross income per farm, not including products fed to live stock, in 1900, was \$1,224.

Using the above unit averages, the result of the successful completion of this great irrigation project may be briefly summed up as follows:

New farms	5,500
Increase in irrigated land, in acres	272,000
Value of new farms at \$58 per acre	\$15,776,000
Value of farm property, including live stock	12,430,000
Total increase in farm values	28,206,000
Total gross annual income from new farms	6,732,000

The Boise-Payette project alone will add 42 per cent to the value of farm property and 37 per cent to the gross income from farms in Idaho. A project that promises such immense returns deserves the close attention of the people.

SOME FEATURES OF THE SWISS FOREST SERVICE.

BY

AUSTIN CARY,

FORESTER TO THE BERLIN MILLS COMPANY.

PASSING acquaintance for three weeks with Swiss forests and forest officers affords slight basis for criticism or even for exposition. It can not fail, however, to breed in any intelligent traveler a hearty respect for the Swiss service and its achievements.

Switzerland and Holland are two countries which should be peculiarly honored for the use they have made of naturally small resources. While the Hollanders have been reclaiming great areas of productive land from the sea, the Swiss with equal persistence and equal genius have been making the very best of their naturally broken and unproductive country. In this work the foresters have had an important share. New woods have been planted and old ones put into productive shape. Mountain torrents have been so controlled that they can do no damage either on the slopes above or the fields below. Safety has been secured to the people from landslips and avalanches, and considerable area added to the productive surface of the country. This work has exercised not only a high degree of technical skill, but it has furthermore, in the free political condition of the

country, involved education of the people and many forms of coöperation between the general government, the cantons, the towns, and interested parties. It is in view of these last facts especially that what has been accomplished by the Swiss should be an encouragement to us in America.

What a difference in the aspect of a country is wrought by an intelligent and progressive people! One has to go no farther than Italy and Greece to see what the results of national poverty, weakness, and disunion may be. The Swiss, on the other hand, seem to be steeped in the ideals of national progress and coöperation. In their situation, indeed, forestry is a prime necessity. With 28 per cent of the area of the country entirely unproductive and the main industries of the people agricultural and pastoral, the 20 per cent that they can spare for forest is not enough, even under good management, to supply the needs of the country for timber. The price of all qualities of wood is very high, and 16,000,000 francs' worth is annually imported from Austria and Germany.

From the simplest point of view, there

fore (that of timber supply), forestry is a national necessity with the Swiss. A general law on the subject has been in force for many years, but it was extensively revised in 1902. This code asserts in the first article that the oversight of all forests within the limits of the country is within the province of the general government, whether those forests are the property of any public body or whether belonging to individuals. The second provision of the law is the definition of *Schutz* or protection forests, those whose maintenance is for any reason a necessity to the country, and such as can not be so considered. In management the plan is to secure a certain standard and uniformity without violating local independence. To the cantons is left the regulation of their own or municipal woods, and the control exercised over private forests within their limits, while to a central bureau at Berne is reserved the right to veto appointments made and to see that work is done within the lines of the federal regulations.

How this works will be best illustrated by the arrangement in force in Canton Zurich. This canton has 47,024 hectares of (116,000 + acres) forest, of which 53½ per cent is owned by private parties, 4.5 per cent by the canton, and the balance by towns and various quasi-public associations. The canton has an Oberförstmeister, with important duties in case of dispute, appeal, etc., and four Kreisförsters, each of whom is responsible for all woods within the limits of his district. The Kreisförster manages the cantonal forests; he keeps run of the private woods and specifies what owners are allowed to do and what is forbidden; he keeps check on the more or less highly trained managers who run the town and corporation forests. Each town or corporation owning forest can choose its own manager, who is locally paid. He must, however, be approved by the forest authorities of the general government, which means almost always that he is a graduate of the forest school at Zurich. Frequently separate holdings of woodland are united for economy's sake under one manager.

One of the charms of the Swiss woods,

which also adds to their value for purposes of study, is the great variety that may be seen on a small area. All Switzerland is only half as large as Maine, and one can quickly and cheaply traverse it. The most characteristic stands, perhaps, are those of the mountains, where on the great heights the larch and spruce hold sway, and lower down come the fir, beech, and other native tree species. Here the wind is a big factor, while the necessity for maintaining a perpetual cover oftentimes entirely dominates the management. Selection forests and very light cuttings are therefore the rule. Here also may be seen clever devices in the way of wood transportation.

The forests of northern Switzerland, on the other hand, are not unlike those of south Germany—varying stands of spruce, fir, and beech for the most part, with a rotation between 80 and 120 years, and natural regeneration, where they can get it, stretching over a sufficient period. There is a good deal of pure spruce here, planted since about 1850, but these pure plantations are now recognized as bad policy, the tendency being distinctly toward more natural forms and management.

As for particular districts, the Sihlwald, near Zürich, has been visited probably by every American forester who has made any inspection of the country, but there are numerous other districts which the Swiss themselves seem to regard with equal pride. Biel is a *bezirk* remarked for its fine and varied woods and its excellent management. At Winterthur the Swiss are now watching with great interest the success of the local officer in the natural regeneration of spruce. Chur again, a mountainous district in the east, is said to illustrate a great variety of forestal conditions and of protective work as well.

Förstmeister Marti at Interlaken is looked on as one of the most capable managers in the country. He certainly proved himself to the writer a most cordial and accommodating man. It was of great interest to see under his guidance the protective work in the Lauterbrunnen valley above Interlaken, which alone has rendered the much traveled

railway to Grindlewald and the Jungfrau safe and practicable. 120,000 francs have been expended here, to which, as a public utility, the *Bund* contributed 50 per cent, the canton 30 per cent, the town and the railway 10 per cent each.

This sketch would fail in its main purpose if it neglected the personal impressions gained at the annual Versammlung of Swiss forest officers held last summer, which the writer had the pleasure of attending. It is when a man is unbiased often that you can tell most about him, and if one might trust his eyes and ears on the occasion mentioned, Switzerland is served in this direction by a particularly effective body of men. This was signified not merely by the note of patriotism and public service that was so often sounded in their speeches, but in the make-up of the body as a whole and in the capacity and temper of individuals. All needful types of men were there, from the professor or editor posted on progress in all parts of the world, down to the humble manager of a few hundred hectares of forest belonging to some town. Again, while one may be easily mistaken on such a point, the temper of the men seemed to be thoroughly sound and natural. They were neither too coarse nor too fine for their work, but a well equipped, serviceable body, animated with a high degree of *esprit de corps* and strong love of country. That they thought for themselves and were dominated by no authority was perfectly evident from the criticisms one heard during the field excursions.

Two things were remarked in my observation and study that seem particularly valuable to workers in this country. First is the extent and variety of federal aid extended to the Swiss forestry work. Thus to the salaries of the cantonal forest officers the *Bund* contributes 25 to 35 per cent, and less amounts to the managers for towns and public corporations. To the salaries of forest guards 5 to 25 per cent is contributed by the *Bund*, which also supports yearly courses for their instruction. Accident insurance is provided for all forest officers, and in the cost of this the *Bund* bears a third.

Schutz, or protection work, whether in the way of stream correction or of plantation, is recognized as a matter of general concern. If for this purpose land is to be acquired by the cantons from private parties, the *Bund* may contribute 50 per cent to the cost, without, however, sharing in the acquired title. From 50 to 80 per cent of the cost of new plantations may be paid by the *Bund* and a similar amount toward essential works of stream fixation or correction. Furthermore, if in any publicly owned forests unusual plantations are necessitated by fire, insects, or any other agency, the *Bund* contributes half, while to the cost of roads or other essential means of development it may give 20 per cent. In all cases where these aids are given, the federal authorities assure themselves that the work is carried on in the highest approved manner; so that by this coöperation the interests of the country are furthered in two ways.

The degree and the method of control exercised over private forests varies in the different cantons, as does also, no doubt, the degree of success. Throughout the country there are certain areas recognized as protection forests, which are held strictly, whatever the ownership, under public control. Thus in every canton clean cutting may be prohibited by the authorities or allowed only on the condition of immediate replanting. In some cantons, however, the control goes much farther than that. The public officers may mark the cutting in private woods, and in Canton Zurich may even order planting of a given amount and kind. It was interesting to note that in this canton, in the opinion of many, the officials have too much authority over private woodlands.

In general, however, the relation of the forest officers to the people seems to be a mixed one, involving authority, instruction, and persuasion, in which case, of course, results vary largely with the talent and tact of individual men. Of the success attained some discouraging talk was heard; but, on the other hand, a number of men, who had that very work to do, expressed themselves

as well satisfied with the results. They said men had been led to take an interest in their woods, and, further, that private owners tactfully handled were entirely capable of learning and applying the main principles of good forest management. In short, the general

judgment seemed to be that the private forests of the country were in reasonably good bearing condition. This, considering particularly the thorough democracy of Switzerland, should be very encouraging news to workers in forestry in our own country.

PROPOSED RECLAMATION WORK IN NORTH DAKOTA AND MONTANA.

IF ENDORSEMENT OF THE PEOPLE IS SECURED, THE
FORT BUFORD PROJECT WILL LIKELY BE TAKEN UP.

A MEETING of great importance to the citizens of North Dakota and eastern Montana was held recently in the office of Chief Engineer Newell, of the Reclamation Service. Senator Hansbrough, Congressmen Spaulding and Marshall, of North Dakota, and Congressman Dixon, of Montana, were present.

The Fort Buford project in the Yellowstone Valley was under discussion, and the detailed maps and preliminary estimates of the engineers were carefully gone over. The engineers' reports indicate that the project is feasible. A canal 70 miles long will irrigate approximately 70,000 acres at a cost of \$25 per acre. This land is adapted to alfalfa growing, a most valuable crop in this section, where stock-raising is the predominant industry.

It was decided at the meeting to present the plans to a board of consulting engineers for final approval, before recommending the project to the Secretary of the Interior for consideration. The physical questions surrounding the Fort Buford project seem capable of solution, but the scheme is complicated by problems of another character which must be settled before the work can be begun.

The lands belonging to the proposed canal system are largely in private ownership, 50 per cent of those in North Dakota and 65 per cent in Montana having passed from the government. Should the Secretary approve this project and set aside a fund for its construction,

work could not be started until the owners of private lands formed an association and agreed to refund to the government the amount expended in the construction of the work. The estimated cost is \$25 per acre, payable in ten annual installments of \$2.50 each, without interest.

The lands belonging to the government will be opened to entry to *bona fide* homesteaders and will be subject to the same terms.

The Fort Buford project is now in the position of waiting for the endorsement of the people. The preliminary work has been done and the government is in a position to pass upon it so soon as it shall be made acquainted with the wishes of the people. From now on the people must take the initiative, perfect an organization, and present their petition in proper form to the Secretary of the Interior.

The estimated cost per acre for this work seems somewhat high, but it is believed that the increased productiveness of these lands, under a canal system which will give them an ample water supply, will prevent this cost from becoming a serious burden on the settlers in this valley.

One of the North Dakota Congressmen pointed out that if a permanent water supply would increase the yield of these lands to the amount of one ton of alfalfa per acre, it would suffice for the annual payment required by the government.

POWER DEVELOPMENT MENACES IDAHO IRRIGATION.

BY

FREDERICK HAYNES NEWELL,

CHIEF ENGINEER, U. S. RECLAMATION SERVICE.

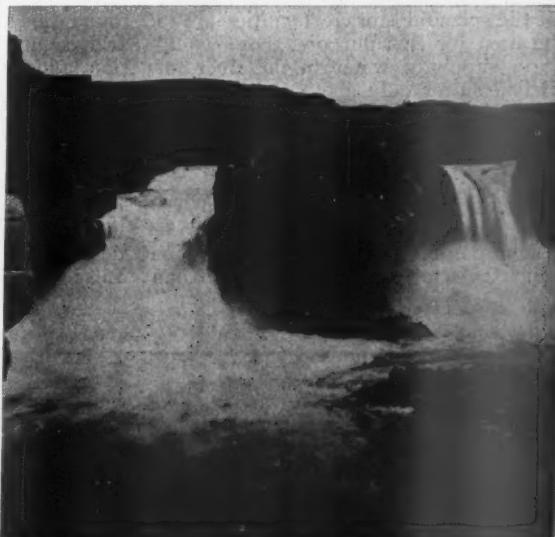
IT is doubtful if any state presents a better field for operations under the Reclamation Act than Idaho.

The arid portions of that state are favored with a fine climate, plenty of good irrigable land, and large streams whose discharge can be easily controlled. All that is necessary to insure material development of this arid region is the bringing together under proper relations of two of these resources, land and water, which can be done at a comparatively small cost per acre. There is an earnest desire on the part of the citizens of the state that irrigation development by the national government be pushed forward on broad lines. The people, however, are singularly blind or strangely indifferent to the manner in which their interests are endangered by certain promotion companies.

Irrigation development at its very inception in the Snake Valley is threatened by the proposed construction of a power plant, the promoters of which claim the right to use the only supply of water available for irrigation. Already more than four times the low-water flow of Snake River is claimed for the development of power. The two large Carey Act projects now well under way in the Snake River Valley, together with the two feasible projects recently investigated by the Reclamation Service, will, when carried to completion, reclaim more than 635,000 acres of land, practically double the

area now irrigated in that state. These lands lie in large bodies, which insures the building up of important centers of wealth and population. All this splendid development depends upon overcoming the condition of aridity, for without water these lands must forever remain in their present desert state.

The theater of this future activity lies comparatively remote from any large town or settlement, being 150 to 200 miles distant from Boise, and about the same distance from the most important centers of population in Utah. Today these bodies of land form part of the vast unbroken wilderness of sage brush which stretches across the state from east to west, a desert scene never to be forgotten by even a western traveler.



TWIN FALLS, 180 FEET HIGH; ON THE SNAKE RIVER, IDAHO.

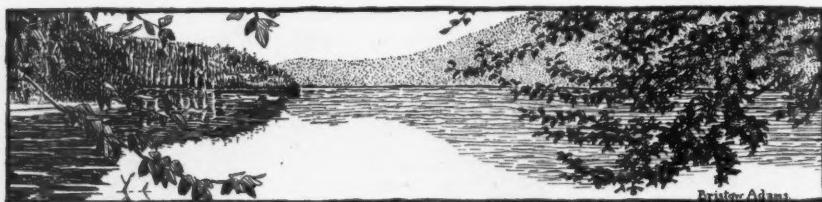
Provided with water for irrigation, orchards and meadows, villages and towns, and in a few years even cities would greet the eye. The increment to agricultural wealth in the state following the irrigation of these lands would aggregate more than sixty millions of dollars, and several hundred thousand people would be added to the population of the state. Irrigation must come first, and in order to irrigate these lands the right to use the waters of Snake River must, of course, be unquestioned.

The prospect of early irrigation and settlement of these large areas has excited interest in the possibilities of power development in that region, and a few promoters have been quick to take advantage of imperfect laws and have obtained power rights on the stream. These power plants are to be located at Shoshone Falls, a point where the river makes a vertical drop of more than 200 feet. The choice of a site for this enterprise is most unfortunate, as it is below practically all the irrigable lands in Snake River valley. It would require the use of all the storage facilities on the South Fork of this stream and more, or about 1,000,000 acre feet, to furnish the water claimed for this purpose alone. If the splendid storage facilities are to be used for this purpose, there would be a supply of water in the river for irrigation for only about three months of each season, or during the flood discharge of the stream. On the other hand, if these lands are to be reclaimed, there will not be any water in the river at this point for power purposes for several months during each season, as all the water will be diverted above this point. More than

70 per cent of the irrigable lands of the valley will have to be furnished with water for their late irrigation, necessitating the utilization of practically every storage site existing in that drainage basin for that purpose.

The nature and magnitude of the conflict between these interests should be readily understood. The impending conflict might be easily obviated if a site for power development were selected above instead of below large bodies of irrigable land. American Falls offers an ideal location for the development of water power. It is located above nearly 400,000 acres of irrigable land, the late water supply for which, to the extent of nearly 3,000 second feet, will have to be furnished from reservoirs. This supply will have to pass these falls, increasing the discharge of the river during its lowest stage from 2,000 to 5,000 second feet, enough for the creation of over 20,000 horse power, which can be developed at very reasonable expense, and without conflicting in any way with the rights of irrigation in any part of the Snake River valley.

The development of cheap power is very essential and is a powerful agency in the building up of any country. The foundation of the development of any arid country is not power, but irrigation, and the right to the use of the streams for any other purpose must be subservient to irrigation rights if such development is to be full and complete. When it is realized that at best probably not more than 4 per cent of the arid portion of Idaho can ever be reclaimed, there should be no question as to the desirability of having these resources fully utilized.



Bristol Adams.

FOREST EXTENSION IN THE WHITE MOUNTAINS.*

INTERESTING STUDY OF REPRODUCTION OF SCRUB SPRUCE AND BALSAM IN ALPINE SITUATIONS.

BY

T. L. HOOVER.

B LACK spruce (*Picea mariana*) and balsam (*Abies balsamea*) have climbed almost to the summit of the Presidential range. Balsam was observed as high as 5,500 feet on Mt. Washington and spruce at 5,300 feet on Mt. Clay. Seeking shelter among the rocks and crouching in the surface hollows, their stunted forms reach out the gnarled and twisted branches, as if joining hands for mutual encouragement and support, and bid defiance to the elements.

This steady upward progress, persistent in the face of adverse conditions of soil and climate, must be the work of many successive generations. And yet a striking fact in this connection is the almost entire absence of fruiting bodies on the upper limits of growth. By the casual observer a cone on either species is seldom seen in these lofty situations, and only careful search will reveal them to a close observer. How, then, does reproduction, so necessary to this steady advance of the species, take place?

In uprooting a balsam for an examination of its root system, the writer was obliged to follow out carefully a slender, wiry root for a distance of six or eight feet from the stock. But the root, instead of tapering down and ending in fine rootlets, was found to be attached to the stock of another scrub balsam. Further examination disclosed the fact that other roots of the same plant terminated likewise in attached but virtually independent plants. In some instances these primary offspring were found to have given rise to a still more recent generation. Thus from a single parent stock a whole clump had been formed.

This, then, is the solution. Instead of being dependent upon the usual reproduction from seed, the plant under unusual conditions has evolved a process of natural root-layering.

Subsequent investigation revealed the same method of reproduction with both the balsam and the spruce. In the shallow, scanty soil the roots of a plant run far out, but close to the surface. Then by some process an aerial system develops from the root, and a new plant comes into being, which in time develops its own root system, and thus establishes an independent existence. In some instances the genealogies of living plants were traced back directly to an old dead stock; hence a clump of scrub may be regarded as a vitally connected colony arising from one or several parent stocks.

With this explanation in mind, the question arises, "To what extent do the seeds *occasionally* produced take part in reproduction?" The writer was not successful in finding any seed of the previous season. All seed collected was several or many years old. The cones were all undersized, and none of the seeds seemed plump and sound.

Of the seed collected the following was submitted for testing to the Seed Laboratory of the United States Department of Agriculture: *Picea mariana*, 5,100 feet; *Abies balsamea*, 5,000 feet, and *Picea mariana*, 4,400 feet. The first two specimens gave no results whatever. The last gave a germination of 6 per cent. This evidence clearly shows that whatever reproduction takes place in such situations can be to only a very small extent from seed.

* All altitudes are measured from sea level.

The writer believes that this problem offers attractive opportunities for further study to determine the exact process of sprouting from the root system, and to fix more surely, by a greater

number of tests, the reliability of germination from seed.

It is hoped that some one may have opportunity and inclination to complete the study.

THE MILK RIVER PROJECT.

LATEST NEWS CONCERNING A DESIRABLE BUT EXTREMELY DIFFICULT PIECE OF RECLAMATION WORK.

CITIZENS of Montana residing in the valley of Milk River are gravely concerned over the proposed extensive diversion of the waters of that stream in Canada, and are importuning the government to intervene in order that their prior rights to the water may be protected. The government itself is concerned in this matter, as it has constructed an irrigation system at Fort Belknap, which is a prior appropriation to that of the Canadians.

Citizens in the lower Milk Valley fear that the Canadians' works will exhaust the normal flow of the river, leaving them without water during the low stages of the stream. Unfortunately for the Montanans, the government's work of constructing an extensive irrigation system combining large storage reservoirs in St. Mary Lakes with many miles of canals has been delayed, owing to the unfavorable physical features which were encountered by the engineers and to other obstacles in the shape of prior rights and difficulties in securing right of way.

The government project is divided into two sections—the storage of flood waters in the mountain catchment area of St. Mary River and the utilization of the water on the irrigable lands of the lower Milk River Valley. The engineering surveys in the St. Mary Basin are practically completed, but the best method of bringing this water to the lower lands has not yet been found. The simple plan of permitting the stored waters to flow down the stream through Canada in the natural channel has been abandoned, owing to the international complications, and the alternate plan of utilizing Cutbank Creek

and Marias River is receiving careful consideration.

The survey of the Marias River has not been completed, and it is not possible at this time to state whether a diversion is feasible or not. While the engineers consider it a difficult proposition, belief is strong that a way out will be found before the close of the coming field season. The question now being considered is whether it will be wise to start construction work in the lower valley, depending only on Milk River for a supply, and before it is found feasible to bring the waters stored in St. Mary Lakes to this area.

While the engineers do not view with equanimity the diversion of the waters of Milk River by the Canadians, they are not becoming unnecessarily alarmed thereat. So far as can be ascertained from the somewhat imperfect maps of the region, the drainage area of Milk River above the point of diversion of the Canadian ditch is approximately 1,050 square miles. This catchment area is not mountainous, but, on the contrary, consists of undulating or rolling gravel hills, from which the run-off is not notably great. In comparison with this the drainage area of Milk River above Malta, Montana, contributory wholly to the flow of the stream in the United States, is 14,044 square miles. In other words, the drainage area controlled by the Canadians is only 7½ per cent of the total drainage area above Malta. Assuming that there is a larger available run-off in the upper part of the basin, this at most can not be considered as affecting seriously the utilization of the water at points near Malta.

It is recognized that any diversion

of Milk River in Canada is detrimental in a certain degree to Montana, but at the same time consideration must be had as to the magnitude of the diversion and its probable effects upon industries in that state. Assuming that the ordinary rules of priority of appropriation apply to the waters of St. Mary River and to those of Milk River, it is evident that by priority of survey and of construction the Canadians have already acquired an unquestioned right to the use of water for considerable areas of land. Their surveys were made some years ago, and construction has been initiated.

In the case of St. Mary River the Canadians are utilizing a considerable part of the low-water flow, but do not, and probably never can, utilize the flood flow, and this can with propriety be stored in St. Mary Lakes and retained in the United States if the project is feasible.

The same is true of the waters of Milk River. The Canadians by priority of survey and of construction have probably acquired a right to such water as they can obtain, but this quantity is limited from the fact that their diversion canal is high up on the headwaters of the river.

THE FOREST INTERESTS OF OHIO.

BY

PROFESSOR WILLIAM R. LAZENBY.

IN his first message to the General Assembly, Governor Herrick said: "It is evident that the State of Ohio should awake to the benefits to be derived in replacing to some extent, at least, the trees and forests which have disappeared.

"In some of the states of the Union legislatures have wisely provided for the protection of forests and woods. I commend this subject to your serious consideration, to see if some means can not be devised whereby the growth of timber may be encouraged, not only for the profit arising from the growing of timber, but for the purpose of preserving our water supplies, protecting ourselves from disasters of flood, and maintaining climatic conditions which are in some degree dependent upon our forests."

In accordance with these suggestions, a committee appointed by the Ohio State Forestry Society, assisted by others interested in the subject, has drafted a bill, which is now before the state legislature.

The main features of the bill are as follows: First, providing for the payment of a premium or bounty of two

dollars an acre for a period of ten years to any land-owner of the state who will plant and care for forest trees in compliance with the rules laid down by the State Board of Forestry; second, giving the Board of Forestry the power to accept by gift or secure by purchase suitable land in any county of the state that it may deem desirable for forestry purposes, at a cost not to exceed ten dollars an acre, and to be retained as permanent forest reserves.

Every loyal citizen will rejoice to learn that Ohio has at last awakened to the importance of saving her forests. This is not a mere local interest, it is a patriotic duty. All civilized nations of Europe have long since enacted laws for the preservation of trees and for the reestablishment and perpetuation of a generous forest area. New York, Pennsylvania, Michigan, and other states are following in their lead.

Shall the great State of Ohio be blind to her future welfare? Each generation is the trustee and guardian of the natural wealth in soil, climate, and beauty of our commonwealth for the generations to come. Shall we by short-sighted selfishness and negligence destroy our

magnificent inheritance? Is there any crime against nature that draws down a more certain curse than that of stripping the earth of all her forests?

We do not object to the removal of forest trees after they attain their highest market value, nor do we claim that the most productive land should be given up to timber growing. What the friends of the Ohio forests ask is that all land that can not be cultivated or is cultivated at a loss should be set apart for timber growing.

Is it not a fact that a majority of our farmers would improve their circumstances and increase their income by concentrating their efforts, applying their labor and fertilizers on two-thirds of the land they now too often skim and skin, giving the residue back to timber growing?

We confidently look toward two agencies that can scarcely fail to encourage and promote the forestry interests of

Ohio. One is the Ohio State Forestry Society, recently organized, and the other is legislation to which reference has been made.

The Forestry Society hopes to accomplish much good by disseminating knowledge of trees and tree planting, by inciting the more general use of trees for shelter, shade, and ornament, and the growing of trees as a farm crop.

It will also furnish a means of co-operation with the National Bureau of Forestry and the American Forestry Association.

The forestry bill seeks to encourage the production of wood as a farm crop, and to illustrate by state forest reserves how to conserve and improve existing woodland, and to exemplify the best methods of forest planting and management. It also aims to advance the cause of scientific and practical education in forestry by bulletins and reports.

Let us save and improve the forests!

STATE FORESTRY IN MINNESOTA.

BY

GENERAL C. C. ANDREWS,

CHIEF FOREST FIRE WARDEN OF MINNESOTA.

NOTE.—The following address, delivered by General Andrews at the last meeting of the Minnesota Forestry Associations, contains so many valuable suggestions regarding the forests of Minnesota, that could be followed with advantage by other states, that we are reprinting it here.—EDITOR.

PINE COUNTY, in this state, contains 900,000 acres of land, exclusive of water. The German State of Baden, which is smaller than Pine county, has 240,000 acres of state forest, from which it derives an annual net profit of \$660,000. The Kingdom of Würtemburg is only a little larger than our St. Louis county, but it has 418,000 acres of state forest, from which it derives a net annual revenue of \$4 per acre, which is a great deal more than our American farmers derive from their cultivated land. The Kingdom of Saxony has 432,000 acres of state forest, from which it derives an annual profit of \$4.50 per acre. In Saxony

they have ascertained that the average annual increment per acre is 225 feet, board measure. They utilize there all parts of the tree, even some of the roots; so from that state forest they have an annual product of 97,000,000 feet of lumber, board measure, and the forest remains unimpaired. It even becomes more valuable from year to year. Now, there are larger countries with these state forests. Prussia has 6,000,000 acres of state forest, from which it derives \$9,000,000 annual revenue, net, and France has 2,000,000 acres of state forest, from which it derives a net profit of \$1.91 per acre. In these cases, of course, the forests are

not all together. They are in scattered localities and mostly on mountains and on sandy soil. These forests have good roads through them, and they are practically national parks, attractive for tourists, and our American travelers find great delight in going through them.

These are samples of what some of the European countries have been doing for a long time, and they show what could be done in this country. Of course, the revenue of the forest would not be so large in this country as in countries thickly peopled and where labor is cheaper and a market is easier of access.

It is said we must wait until there is a strong public sentiment before we can accomplish much in forestry. There is a good deal of sentiment now for forestry. Governor De Witt Clinton did not wait for any very strong public sentiment before he built the Erie Canal. They laughed at him, and many called it "Clinton's ditch." He was a statesman, and he put it through. There was no very great public pressure brought to bear upon our statesmen in Minnesota, of whom Governor Ramsey was the leader, to provide by law that all the school lands should be sold for not less than \$5 per acre. It was because there was a statesman at the head of affairs that it was done. He looked ahead and had it done. The consequence is that Minnesota now has a school fund of \$15,000,000 and which is likely to be increased to \$25,000,000. What we need is a good, strong man in the legislature who will make forestry a specialty. We have friends in the legislature. They added twelve amendments to our fire-warden law in our last legislature. They appropriated \$20,000 to extend Itasca state park. They passed a law authorizing the state forestry board to buy land for forestry purposes at \$2.50 per acre, but they failed to appropriate the money. It was because there was no man in the legislature to make forestry a specialty, and until we have such a man we will make no particular progress in forestry in Minnesota.

We have been discussing forestry for many years in Minnesota. We have a

forestry board which has been in operation five years. We have such men as Frederick Weyerhaeuser, the greatest lumberman in the country; our friend Mr. Owen; John Cooper, who was president of the State Agricultural Society and a lumberman; Professor Green, Dr. A.C. Wedge, of Albert Lea, and others—in all nine members. We are equipped to plant trees on non-agricultural land, but the legislature has given us no money for that purpose.

Let us suppose you are members of the finance committee or the committee on appropriations in the legislature. You are friendly to forestry, but here comes the governor and prominent politicians and say they must certainly have \$100,000 for the St. Louis Exposition. They must have a lot of money for the state university; they must build some more buildings at the state experiment station; they have four insane hospitals and many other public institutions which must be supported. Members from all parts of the state are clamoring for money, and they will have it; and while they are friendly to forestry, unless we have a man who makes forestry a specialty and fights for it with energy, we shall not get money for forestry.

Now, I trust that when you go home and in due time come to elect senators and representatives you will say to the candidate, "My friend, promise me one thing, that you will give earnest support to forestry measures."

What forestry means for Minnesota is simply this: The remaining original pine timber will be cut in the next fifteen years. Some second-growth pine, if protected from fire, will then be cut from year to year, but it will not be as good as the original growth, and there will not be enough of it for home consumption. Lumber will be dearer and our great lumber industry will decline. There are, however, fully three million acres of waste land in scattered localities which if planted with pine would in time become normal forests, yielding forever a supply sufficient for our home need. Such forests would by their growth perpetually yield a net annual revenue on the capital invested of 3 per cent compound interest, besides many

indirect benefits. On such waste, sandy land it will take on an average about eighty years for a crop of pine trees to grow to merchantable size. Individuals can not wait so long for a crop and they will not engage in the business. The

state, to whom time does not occur, must undertake the work by purchasing waste land and planting it with pine.

The forestry board is ready to go to work. Will you see that the legislature provides us with the means?

SOUTHERN IRRIGATION SUCCESSFUL.

NOTES ON RICE IRRIGATION STATISTICS IN LOUISIANA FOR 1902.

CHIEF Statistician, L. G. Powers, has transmitted to the Director of the Census a preliminary statement concerning rice irrigation in the State of Louisiana for 1902. The report was prepared under his direction by Clarence J. Blanchard, and is based upon information obtained by correspondence. The statistics are for the several parishes and indicate a great increase in rice irrigation since the crop year 1899.

Irrigation in Louisiana is restricted almost entirely to the cultivation of rice, in the production of which cereal this state now ranks first in the United States. A few farmers along the Mississippi River in the vicinity of New Orleans report irrigation of other crops, principally vegetables.

Rice is grown to some extent throughout the entire southern fourth of the state, with the exception of a marshy strip about twenty miles in width along the Gulf coast. Within this rice belt, however, there are two regions where rice is grown by irrigation and where conditions are especially suited to its cultivation. The one embraces the lowlands along the lower Mississippi and its outlying bayous; the other comprises the extensive prairies of southwestern Louisiana. These regions are widely dissimilar in soil, and as a result very different methods of irrigating and harvesting are employed. The delta lands of the Mississippi have a deep, rich, alluvial soil, with an elevation little, if any, above the banks of the streams. Those along the Mississippi are, in many places, considerably lower than the surface of its waters, which are

restrained by high levees. Irrigation is by means of flumes in the river levees, by siphons, and by steam pumps. Owing to breaks in the levees caused by floods, the difficulties to be overcome in properly draining the plantations and the unsuitability of the soil for the use of modern machinery, the rice industry in this part of Louisiana has developed but little in the last six or eight years.

COASTAL PRAIRIES.

Louisiana's present leading position among the rice-growing states is due to the discovery of the peculiar adaptability of the coastal prairies to the cultivation and irrigation of rice. This adaptability was first demonstrated by the large yield of irrigated rice in 1897, which immediately caused a great influx of immigrants and capital. These prairies are comparatively level, with a slight slope toward the Gulf, and have ten navigable rivers and numerous lakes and bayous. The soil is not deep, compared with that of the delta lands, but has proved to be wonderfully adapted to the cultivation of this cereal. It is underlaid with an impervious subsoil which plays a very important part in the economy of rice irrigation. This subsoil not only holds the water on the land, but gives a compact base, so that when the irrigation season is over and the levees are opened, the water runs off very rapidly and the ground becomes firm enough to permit the use of the latest improved machinery.

The prairies are never more than seventy and generally range from twenty



IRRIGATION WELLS NEAR JENNINGS, LOUISIANA.

to thirty feet above the surface waters of the streams and bayous. Throughout the prairie region are numerous ridges slightly higher than the rest of the land. It is upon these ridges that the canals are built by throwing up parallel levees from the outside, making what might be termed an overland canal, instead of cutting below the surface. Pumping plants at the heads of the canals lift the water from the stream into the main canals, whence it is carried by gravity to the point of diversion on the land. On some of the large canals more than one pumping plant is frequently required, owing to the necessity of several lifts to get the water into the canal.

The prairies are underlaid at depths varying from one hundred to four hundred feet with a water-bearing gravel, which, when tapped, furnishes a large supply through flowing wells or wells in which the water rises to within a few feet of the surface.

The advantages of the coastal prairies for rice growing over the other regions in which this crop is cultivated, are numerous and readily apparent, and since the introduction of modern methods and machinery in southwestern Louisiana the growth of the industry has been phenomenal.

The Atlantic Coast planter works at a great disadvantage in that his plantation is virtually a swamp reclaimed by strong dikes and levees from the annual floods and from frequent high tides. The annual cost of protecting his fields and repairing breaks in levees is excessive. His rice fields were originally covered with dense forests, to clear which entailed great labor and expense. Owing to the moist character of the soil, his crop must be gathered by hand and carried to higher land to be threshed and cleaned. Plowing and planting for the same reason are slow and tedious.

In the prairie region the methods of plowing, planting, and harvesting are



AN IRRIGATION CANAL, IN THE RICE-GROWING REGION, NEAR JENNINGS, LOUISIANA.

quite similar to those followed by the wheat-growers of the Northwest. Fewer laborers are required and larger areas can be cultivated than in the Atlantic region. The large initial expense for pumping plants and the construction of many miles of canals and ditches is more than offset by the acreage covered and the assurance of large crops.

The year 1902 in Louisiana was one of great extremes. The growing season was marked by excessive drouth, while the hot season of harvest was one of great rainfall. The increased number of pumping plants drew so heavily upon the rivers and bayous in the prairie region that their levels were lowered, and salt water came up from the Gulf. Considerable damage was also caused in the parishes of Plaquemines and Lafourche in the delta lands. The intrusion of

salt water into the rivers and bayous forced the canal-owners to take steps to prevent further losses from this source, and dams costing many thousands of dollars have been built or are being planned to shut out the water from the Gulf.

Irrigators from wells, the supply of which had heretofore proven ample, discovered that many of these were too shallow, and deeper ones have been sunk.

A very important lesson taught by the experience of 1902 is the necessity of more careful grading of the rice fields. Additional levees, with less fall between them, have been thrown up, thus making it possible to irrigate with less water and with more uniform depth, as well as better to utilize the rainfall, which alone will oftentimes enable the planter to save the expense of operating his plant for several days.

FORESTRY AND IRRIGATION IN CONGRESS

A CALENDAR OF NATIONAL LEGISLATION WITH REGARD TO THE PUBLIC LANDS, IRRIGATION, AND FORESTRY.

April 1.

In the House: By Mr. McGuire: A bill (H. R. 14674) providing for free homesteads on the public lands for actual and *bona fide* settlers, and reserving the public lands for that purpose.

April 2.

In the House: The bill (S. 1558) granting certain vacant public lands in the State of Minnesota to that state for forestry purposes was read, and received formal objection from Mr. Williams, of Mississippi.

By Mr. Mondell: A bill (H. R. 14710) authorizing the use of earth, stone, and timber on the public lands and forest reserves of the United States in the construction of works under the national irrigation law.

April 5.

In the Senate: The bill (S. 4401) granting public lands to the State of Minnesota for forestry purposes was passed with amendment.

In the House: Mr. Mondell, from the Committee on Public Lands, to which was referred the bill (H. R. 14622) pro-

hibiting the selection of timber lands in lieu of lands in forest reserves, reported the same without amendment.

April 8.

In the Senate: Mr. Warren submitted amendments to the appropriation bills proposing to appropriate \$375,000 for the care and administration of forest reserves, and \$250,000 to meet the expenses of protecting timber on the public lands.

April 16.

In the House: The bill (S. 4636) to validate certain original homestead entries and extend the time to make final proofs thereon was passed.

April 18.

In the Senate: Mr. Perkins introduced a bill (S. 5567) to exclude certain lands from the Yosemite Park and include the same in the Sierra Forest Reserve.

In the House: Mr. Mondell, from the Committee on Public Lands, reported without amendment the bill (H. R. 14710) authorizing the use of materials on the public lands for building national irrigation works.

April 19.

In the Senate: The bill (S. 2994) amending an act entitled "An act authorizing citizens of Colorado, Nevada, and the territories to fell and remove timber on the public domain for mining and domestic purposes," so as to include Oregon, Washington, and California, was passed.

April 20.

In the Senate: Mr. Martin, from the Committee on Public Lands, to which was referred the bill of the Senate (S. 3165) providing for second and additional homestead entries and for other purposes, reported the same with amendment.

April 21.

In the Senate: The Committee on Public Lands reported without amendment the bill (S. 5567) to exclude certain lands from the Yosemite Park and include them in the Sierra Reserve.

The bill (S. 2860) to further amend an act approved January 21, 1903, entitled "An act to amend an act entitled 'An act to provide for the use of timber

and stone for domestic and industrial purposes in the Indian Territory," was indefinitely postponed.

April 22.

In the Senate: An amendment to the appropriation bill was agreed to, providing \$10,000 for use by the Secretary of Agriculture in testing chemical preservatives for timber at the Louisiana Purchase Exposition.

April 23.

In the House: The bill (H. R. 7296) for the protection of the public forest reserves and national parks of the United States was passed.

April 25.

In the House: The bill (H. R. 14622) prohibiting the selection of timber lands in lieu of lands in forest reserves was passed with amendment.

April 28.

In the House: Senate Resolution 71, directing the Secretary of the Treasury to conduct investigations relative to the use of the waters of the Colorado River for irrigation purposes, was passed.

RECENT PUBLICATIONS.

The Angler's Secret. By CHARLES BRADFORD. pp. 206. Illustrated. G. P. Putnam's Sons, New York.

Followers of Izaak Walton will welcome a new book entitled "The Angler's Secret." The author is Charles Bradford, who is already widely known for his earlier volumes, "The Wild-Fowlers" and "The Determined Angler." The latter work, which was called by Grover Cleveland "the most pleasant and practical and sensible volume I have ever seen of its kind," was devoted to brook trout only. This new book, which is fully illustrated, treats of the sporting species of both fresh and salt water fish—from the tiny mountain trout to the mighty striped bass of the ocean. It contains a full description of various tackles, and the methods of catching these fish, together with notes of their habits and habitats.

The latter part of the book considers, not so much the methods of actual fish-killing as the glory of the chase—the lovely scenery, pure air, the natural exercise, and the general exhilaration. All these things are appreciated by the true and chivalrous angler more than the actual filling of the creel.

The author quotes often and appropriately from angling authorities ranging all the way

from Izaak Walton to ex-President Cleveland. Not the least praiseworthy part of this admirable little volume is the tasteful manner in which it is illustrated. "The Angler's Secret" is a delightful little book.

The American Carnation; How to Grow It. By CHARLES WILLIS WARD. Pp. 296. Illustrated with colored plates and half-tones. A. T. De La Mare Printing and Pub. Co., New York.

Here is a delightful and valuable book for the large and growing class who love the carnation. It is written from a minute study of the subject, backed up by twelve years' practical experience in growing carnations. Mr. Ward, the author, has been a big factor in bringing the American carnation into the forefront of popularity among flowers in this country. His extensive and admirably equipped gardens have given him unusual opportunities at first hand to make a most intimate study of this flower.

The volume opens with a description of the origin and early history of the carnation, and a special chapter on the "Carnation in America." General greenhouse culture, the preparation of soils, and in fact every detail of car-

nation culture from the first planting to the picking and shipping of the flowers is discussed in a clear, concise manner. Carnation culture in various parts of the country is fully treated, and there is a chapter on the American Carnation Society. A valuable feature of the book is the wide use of illustrations in it. They are wonderfully helpful. This is an exceedingly valuable book for floriculturalists generally, as well as the carnation specialist.

It is of interest to note that Mr. Ward is also a strong advocate of forestry, possessing special knowledge of its practical side through large ownership of timberlands and extensive lumbering operations.

The Nature Library. In ten volumes. Pp. in all, 4,000. Illustrated with plates in full color, half-tones from photographs and drawings. Doubleday, Page & Co., New York.

In these volumes further impetus is given to the nature-study movement; not, however, as heretofore, by stories with a world of what John Burroughs calls "misleading romanticism," but by serving as a pleasant and instructive guide to the animal and plant life around us. There is a charm in each volume, and the scientific accuracy of each writer does not display itself in wearying pedagogy. A volume is devoted to each of the following subjects: "Fishes," "Mushrooms," "Wild Flowers," "Game Birds," "Insects," "Bird Neighbors," "Bird Homes," "Butterflies," "Moths," and "Animals." Each subject is supplemented by illustrations, which constitute almost a volume in themselves and which are true to the subject and yet things of beauty. The volumes have a charm that makes them readable merely as books, and the scope and accuracy of treatment accorded each subject, together with excellent topography and make-up, leaves little to be desired.

NEW MEMBERS OF THE AMERICAN FORESTRY ASSOCIATION.

The following-named persons have joined the American Forestry Association since our issue for March:

- Agar, John G., Bank of Commerce building, 31 Nassau street, New York City.
- Bartrum, S. C., Forest Supervisor, Roseburg, Ore.
- Booth, George G., 605 Trumbull avenue, Detroit, Mich.
- Canby, Henry M., 1101 Delaware avenue, Wilmington, Del.
- Cristy, Harlan P., 520 Atwater street, East, Detroit, Mich.
- Crosby, William A., Hinckley, Me.
- Detwiler, S. B., Bureau of Forestry, Washington, D. C.
- Dike, Miss A. M., 29 Washington square, New York City.
- Ehrehart, J. E., State Tax Department, Albany, N. Y.
- Eno, Miss Mary P., 18 West Thirty-eighth street, New York City.

Hazen, George H., 32 East Seventeenth street, New York City.

Hinckley, Rev. George W., Hinckley, Me. Hinderlider, M. C., Chamber of Commerce, Denver, Colo.

Hogue, A. H., Fresno Flats, Cal.

Huthinson, John P., Georgetown, Burlington county, N. J.

Kehrer, G. F. W., Lagersdrift, District Midleburg, Transvaal, South Africa.

Kelley, William E., 901 Chamber of Commerce, Chicago, Ill.

King, Clark, 25 Claverly Hall, Boston, Mass.

McLennan, J. S., Petersfield, Sydney, Cape Breton, Canada.

Morley, George, 520 Atwater street, East, Detroit, Mich.

Peery, E. H., Livingstone, Ariz., care of U. S. Geological Survey.

Pope, Willis T., Honolulu, T. H.

Robbins, Royal, 373 Washington street, Boston, Mass.

Rowe, Henry C., 490 Orange street, New Haven, Conn.

Smith, Walter M., Stamford, Conn.

Viles, Mrs. E. P., Skowhegan, Me.

Weber, W. Hoyt, Stamford, Conn.

Weddle, Harry H., El Cajon, San Diego county, Cal.

Wing, John B., 22 William street, New York City.

PUBLISHER'S NOTES.

NURSERYMEN SHOULD BE SURE.

Any system that reduces chances of error in labeling nursery stock is worth earnest consideration. When a man pays for fruit trees of a certain variety, it is good policy for the nurseryman to make sure his customer gets them.

The success of Carl Sonderegger, proprietor of the German Nurseries at Beatrice, Nebraska,



has grown out of his extreme care in delivering just what is paid for. This policy has developed a long list of confiding customers for nursery stock, who are certain that when it buds, leaves, and bears it will be the exact variety they wanted.

Another valuable feature is that Mr. Son-

deregger is a careful shipper, and his trees and plants all arrive in a sound, healthy, growable condition; in fact, he guarantees their safe arrival at any railroad station in the United States to which shipments are made. Damp moss and expert packing are the reasons why he can send nursery stock to any address. His catalog is a good one to have at one's elbow. He sends it free anywhere.

WALL MAP OF THE WORLD.

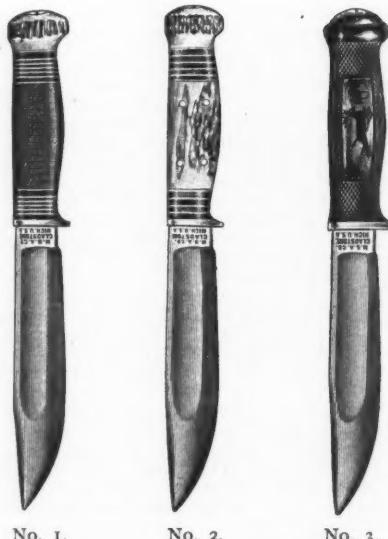
A beautiful map, valuable for reference, printed on heavy paper, 42 x 64 inches, mounted on rollers; edges bound in cloth, showing our new island possessions, the Trans-Siberian Railway, Pacific Ocean cables, railway lines, and other features of Japan, China, Manchuria, Korea, and the Far East. Sent prepaid on receipt of 25 cents in stamps by W. B. Kniskern, P. T. M., Chicago & Northwestern Railway, Chicago, Illinois.

DEPENDABLE KNIVES.

The illustrations herewith show Marble's 6-inch Ideal hunting knife with three styles of blade, Nos. 1, 2, and 3. The blade as at present made is a modification of the two shapes of blades formerly made, known as sticking and skinning points, and is claimed by many expert hunters and woodsmen to combine more of the essential qualities for all-round use than are usually found in one style of knife.

The new blades are slightly thinner than the old pattern and carry a more gradual bevel back of the edge. The bone chopper at the back of point is a valuable feature for rough work.

The solid hard-rubber handle, No. 3, is considered by some to be superior to any other material for the purpose. The heavy tang, threaded at the end, just fits the mortise in the handle, and a half-inch brass nut countersunk in the end of the handle, engaging with threaded tang, makes the strongest fastening that it is possible to make.



No. 1.

No. 2.

No. 3.

The stripes or trimmings at each end of the No. 1 and No. 2 handles are made up of alternate washers of colored hard fiber and brass or German silver, that are a driving fit on the tang. The center of the No. 1 handle is composed of leather washers put on under heavy pressure and held in place by the nut countersunk into the end of stag tip. The No. 2 is the same construction, except that the center is composed of two grooved slabs of selected stag riveted together and driven on the tang the same as the washers.

The popularity of the Marble knives is proved by the fact that the sales are considerably more than doubling up each year.

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Foresters and Inspectors Wanted for the Philippine Forestry Bureau

The salaries of Foresters, Assistant Foresters, Inspectors, and Assistant Inspectors range from \$1,200 to \$2,400 per year. Actual and necessary traveling expenses to and from the scene of field work are allowed, and while in the field one dollar gold per day is allowed for subsistence.

There are a number of vacancies in the different grades, and good men are urgently needed for this interesting and important work.

The work of the Foresters is, to a large extent, technical; that of the Inspectors more administrative and less technical.

Examinations will be held in different parts of the United States about July 1 and November 1. For detailed information apply to the Bureau of Forestry, Washington, D. C., or to the Bureau of Insular Affairs, War Department, Washington, D. C.

Foresters and Inspectors now in the Philippine forest service and having from two to three and a half years' service, find the work very attractive, instructive, and healthful.

Copies of the Philippine Civil Service Manual may be obtained from the Bureau of Insular Affairs, War Department, Washington, D. C.

The reports, bulletins, and other publications of the Philippine Forestry Bureau should be read by all desiring to enter the service. Copies may be obtained by addressing the Forestry Bureau, Manila, P. I.

Marble's Fish Knives



Have a thumb rest which enables you to put the pressure in the right place when cutting off head and tail. The blades are of tempered tool steel.

This one is 2½ in. long and sells for 85c. We make two other styles. The handles are rosewood inlaid with German silver. You get a sheath free with each knife.

Automatic Gaff

You merely reach out, gently touch the fish, and the Gaff closes with a grip that HOLDS. This means the saving of the big ones that have gotten away year after year. Used with one hand, opened with foot.

No. 1, for fish \$1.50
from 1 to 20 lbs.

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Handles 30 inches.
Nickelized, 50c. extra.



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Makes a fire certain in any weather. 50 cents. Send for catalog of other necessities for sportsmen and hunters. It is free.

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The objects of the Association, as set forth in its Constitution, are as follows:

1. The adoption by the Federal Government of a permanent policy for the reclamation and settlement of the public domain, under which all the remaining public lands shall be held and administered as a trust for the benefit of the whole people of the United States, and no grants of the title to any of the public lands shall ever hereafter be made to any but actual settlers and homebuilders on the land.
2. The preservation and development of our national resources by the construction of storage reservoirs by the Federal Government for flood protection, and to save for use in aid of navigation and irrigation the flood waters which now run to waste and cause overflow and destruction.
3. The construction by the Federal Government of storage reservoirs and irrigation works wherever necessary to furnish water for the reclamation and settlement of the arid public lands.
4. The preservation of the forests and reforestation of denuded forest areas as sources of water supply, the conservation of existing supplies by approved methods of irrigation and distribution, and the increase of the water resources of the arid region by the investigation and development of underground supplies.
5. The adoption of a harmonious system of irrigation laws in all the arid and semi-arid states and territories under which the right to the use of water for irrigation shall vest in the user and become appurtenant to the land irrigated, and beneficial use be the basis and the measure and limit of the right.
6. The holding of an annual Irrigation Congress, and the dissemination by public meetings and through the press of information regarding irrigation, and the reclamation and settlement of the arid public domain, and the possibilities of better agriculture through irrigation and intensive farming, and the need for agricultural education and training, and the creation of rural homes as national safeguards, and the encouragement of rural settlement as a remedy for the social and political evils threatened by the congestion of population in large cities.

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43,000 acres of timber land, a continuous body, located on both sides of a navigable river and convenient to 3 lines of railroads. Logging operations can be conducted all the year round at a very low cost. Labor cheap and plentiful. A large milling concern in this locality cuts and delivers logs from stump to mill for \$1.50 per thousand. The timber is estimated to cut on an average of 26,000 feet per acre; some acres will cut as high as 80,000 to 100,000 feet. The character of timber per acre, estimated, to cut as follows: Oak, 6,000 feet; Gum, 5,000 feet; Ash, 2,500 feet; Pecan, 4,000 feet; Persimmon, 3,000 feet; Hackberry, 2,000 feet; Elm, 1,000 feet; Cypress, 1,000 feet; Locust, 1,000 feet; Tupelo Gum, 1,000 feet. This tract is unexcelled of its kind in the South. Full particulars, together with price and terms, furnished on application.

HARDWOOD.—76,000 acres on both sides of the Ouachita River, in Union, Bradley, and Ashley counties, Arkansas, with splendid transportation facilities. It consists of hardwoods with a little Pine, and will cut an average of 6,000 feet to the acre. About 70% of this amount is White Oak, and the remaining 30% is divided between Red and Willow Oak, Pine, Cypress, and Gum. Disinterested individuals who have just returned from ranging this timber speak of it in the highest terms and say that as a milling proposition it is by all odds the best they have seen in the South. The average cut given above is based on a very careful and conservative estimate made of 69,000 acres, the balance having been made after the estimate was made. The soil is very rich and fertile and when ready for the plow will sell for more than is now asked for land and timber. \$5.50 per acre.

HARDWOOD.—10,000 acres in Arkansas; on railroad and also navigable river flowing into the Arkansas. Will cut 10,000 feet per acre; large percentage White Oak; balance Red, Burr, Water, Post, and Overcup Oak, Ash, Gum, and Hickory. Price, \$5.50 per acre.

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CYPRESS TIMBER.—Near the St. John's River, about 1,400 acres of good cypress timber; can be bought cheap for the quality; located in the midst of a forest of Longleaf Yellow Pine, also at a reasonable price. Full particulars given on application.

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FLORIDA—Continued

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LONGLEAF PINE.—140,000 acres. This is guaranteed to cut 2,500 feet per acre. Price, \$2.50 per acre.

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LONGLEAF PINE.—20,000 acres in central part of state, 2½ miles from railroad. Estimated cut is from 3,000 to 4,000 feet per acre. Price, \$3 per acre.

LONGLEAF PINE.—16,500 acres in northwest part of state, guaranteed to cut 88,000,000 feet. Splendid transportation. This is one of the very best propositions that we know of in the state of Florida. Price, \$8.25 per acre.

LOUISIANA

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HARDWOOD.—6,300 acres near Washington, La., one-half mile from railroad. Will cut 8,000 feet per acre; 4,000 feet White Oak, then Red Oak, Gum, and Ash. Bordered by navigable river; soil alluvial and very rich. Price, \$8 per acre.

HARDWOOD.—33,000 and 17,000 acres, bordered by Tensas and Macon Rivers. The main line of the Gould system is surveyed through this land. This is one of the best timber and land propositions in the South. Will cut 8,000 feet per acre of Oak, Ash, Gum, Pecan, and Cypress. Price, \$6 per acre.

LONGLEAF PINE.—17,000 acres in central part of state. Estimated cut is from 6,000 to 8,000 feet per acre. Tract crossed by two railroads. This is a new property and a bargain at the price, \$8.50 per acre.

SHORTLEAF PINE.—35,000 acres in central part of state, crossed by railroad. This tract will cut something over 6,000 feet per acre. It is a new property and never before offered by anyone. Price, \$8.50 per acre.

SHORTLEAF PINE.—24,000 acres in west-central part of state. It will cut 5,000 feet per acre of Shortleaf Pine and 2,500 feet per acre of Oak. This proposition includes a bran-new sawmill of 60,000 feet per day capacity. The tract has water and rail transportation. A very great bargain at \$6.50 per acre, including plant.

MISSISSIPPI

LONGLEAF PINE.—55,000 acres, with new mill and equipment. Timber will cut 300,000,000 feet. Tract is very favorably located and has splendid transportation facilities. **Price, \$650,000.**

LONGLEAF YELLOW PINE.—50,000 and 8,000 acres of Longleaf Yellow Pine. This is a fine tract of pine near the N. O. and N. E. R. R. Will cut 10,000 feet per acre of Longleaf Yellow Pine. Lies in comparatively compact body. Price of the 40,000 acres, **\$25** per acre in fee-simple; of the 8,000 acres, **\$16** per acre in fee-simple.

LONGLEAF PINE.—25,000 acres on railroad. Guaranteed to cut 8,000 feet per acre. Also sawmill and full equipment. **Price, \$450,000.**

LONGLEAF PINE.—10,000 acres. Will cut 8,000 feet per acre. One-half has been turpentined. **\$9** per acre for that which has been turpentined, **\$11** per acre for that which has not.

HARDWOOD.—38,760 acres, lying between the Yazoo and Sunflower Rivers, both navigable and here only ten miles apart. The Yazoo & Mississippi Valley Railroad crosses one corner of the tract. This tract is claimed by timber experts to cut 7,000 feet per acre of the usual hardwoods of this locality—oak, hickory, gum, ash, etc. **Price, \$7.50 per acre.**

HARDWOOD.—6,000 acres within one mile of railroad. Estimated to cut 5,500 feet poplar, hickory, and white oak. **Price, \$9 per acre.**

HARDWOOD.—10,000 acres on new railroad. Estimated to cut 5,500 feet per acre, poplar and white oak. Land very rich, worth \$20 per acre for farming when timber is removed. **Price, \$11 per acre.**

HARDWOOD.—44,000 acres hardwood. Will cut 9,000 feet per acre, white and red oak, hickory, ash, gum, and cypress. Railroad runs through this tract. **Price, \$7.50 per acre in fee-simple.**

HARDWOOD.—100,000 acres hardwood on Yazoo & Mississippi Valley Railroad and Sunflower River. Virgin forest—oak, ash, gum, and cypress. Will cut 9,000 feet per acre. **Price, \$10 per acre.**

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70,000 ACRES PINE, CYPRESS, JUNIPER, ASH, AND GUM TIMBER in Eastern North Carolina. This property is located on two sounds which empty into the Atlantic Ocean, 100 miles south of Norfolk, Va. Exceptional water transportation facilities. The longest haul to water will not exceed four miles, and would require railroad and steam skidder. The timber is estimated by a practical timber expert to cut the following amount of merchantable lumber: 85,000,000 feet of Short Leaf N. C. Pine, 100,000,000 feet of Juniper, 15,000,000 feet of Cypress, 100,000,000 feet of Black and Sweet Gum. The timber rights on the above will be sold for less than one dollar per thousand, with ample time to remove same, or can be purchased in fee, together with 80,000 acres additional, suitable for game preserve or farming purposes, at a very small cost. This is probably the best investment in North Carolina for the money.

HARDWOOD.—20,000 acres of hardwood in Macon county. Will cut 8,000 feet. Six miles from railroad, now being built. **Price, \$5.00 per acre.**

HARDWOOD.—12,000 acres. Virgin forest of poplar, white oak, red and chestnut oak, hemlock, and some white pine. $1\frac{1}{2}$ cords tan bark per acre. This property is at present 14 miles from the railroad, but the Southern Railroad is now building a branch which will pass through this tract. Will cut from 12,000 to 15,000 feet per acre, on a conservative estimate. **Price, \$7.50 per acre.**

12,000 acres in the southern part of state. Will cut 42,500,000 feet of timber, mostly Longleaf Pine, with some White Oak, Cypress, and Poplar. This tract has splendid transportation facilities. **Price, \$6 per acre.**

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GROUP B.—22,000 acres, estimated to cut 80,000,000 feet of choice cypress, 70,000,000 choice short-leaf North Carolina pine, balance of timber oak, ash, hickory, sycamore, gum, etc.

GROUP C.—14,000 acres, estimated to cut 30,000,000 feet of choice cypress, 15,000,000 of oak, 15,000,000 short-leaf pine, 8,000,000 cottonwood, 10,000,000 ash, balance hickory, sycamore, elm, gum, etc. If the above tracts are purchased outright the timber will cost less than one dollar per thousand.

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